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## ENERGY

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# ENERGY

No. 139

## CONTENTS

PIPELINES

PIPELINE CONSTRUCTION

OIL AND GAS

UDC 665.62

# INDUSTRIAL TREATMENT OF GAS, CONDENSATE IN EASTERN TURKMENIA

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 8, Aug 82 pp 15-17

[Article by M. Mamedov, P. Akiyev, V. F. Solgalova and V. V. Yerofeyev, Turkmen Institute of the Gas Industry; Turkmen Affiliate, All-Union Scientific Research Institute of the Gas Industry]

[Text] The volumes of gas production provided for under the 11th Five-Year Plan at the "Turkmengazprom" Production Association will be ensured by the stabilization and maintenance of the maximum output of gas in already worked deposits and the starting-up of new deposits.

Due to the considerable distance of the principal users from the gas-producing fields of the republic the increase in the volumes of gas production is being accompanied by the development of the gas pipeline system and improvement in technical facilities and methods for the preparation of gas for distant transport. Particular attention is being devoted to the quality of preparation of gas for distant transport and an increase in the output of a valuable by-product, gas condensate, without substantial additional expenditures.

At the "Turkmengazprom" Production Association definite experience has been acquired in the operation of technological apparatus for the industrial preparation of gas in the process of working of gas condensate deposits, characterized by a great diversity of geological-field and thermodynamic conditions.

Apparatus for the artificial cooling of gas, direct-flow separators with Teflon packets and other equipment are being used for increasing the effectiveness of industrial preparation of gas. Their creation is taking place with the creative participation of specialists and scientists of the Turkmen Institute of the Gas Industry, the Turkmen Affiliate of the All-Union Scientific Research Institute of the Gas Industry, the All-Union Gas Scientific Research and Production Institute, TsKBN, Ukrainian Scientific Research Institute of the Gas Industry and other organizations.

The article below tells in greater detail about this work.

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The gas industry workers of Turkmenia are faced with the important task of an accelerated development of the gas industry by the starting-up of new deposits. A particularly high evaluation is given to the prospects for finding gas deposits in Eastern Turkmenia; during recent years a reliable raw material base

has been created for a system of key gas pipelines extending between Central Asia and the Center.

Now the association is working 14 deposits. Within the limits of Eastern Turkmenia it is possible to distinguish two gas-bearing regions (Murgabskaya and Amudar'inskaya), the geological field conditions in which are to a great deal similar, but there are also definite differences with respect to such important characteristics as the lithological-tectonic characteristics of the deposits, physicochemical properties of the collectors and the fluids saturating them, thermopressure conditions, etc.

Over the territory of the Murgabskaya gas-bearing region one finds the Bayram-Ali, Shatlak and Tedzhen deposits, which are now in work, and the Mollaker, Vostochnyy Tedzhen, Sovetabad-Dauletabad, Uchadzhi, Shorkel' and Seyrab deposits, prepared for being put into operation.

In the Amudar'inskaya gas-bearing region one finds major multistrata gas condensate deposits -- Achak, Naip, Gugurtli, Beurdeshik -- and single-stratum deposits -- Kirpichli, Severnyy Balkun, Gagarina, Saman-tepe, and others.

The collection of gas in all the deposits is accomplished using a radial scheme and its processing is carried out for the most part by the NTS method with use of the natural pressure drop in the borehole-separator system and also by the cooling of gas in air and water condensers with recovery of the energy of the return flow in jacketed tube "gas-gas" heat exchangers.

Apparatuses of such a system combine the processes of drying and extraction of hydrocarbon condensate from the production of boreholes. However, the inadequate thermodynamic effectiveness of the throttling process, associated with a decrease in stratum pressures, limits the time of effective use of the natural energy of gas for the throttling process. This leads to the need for the use of artificial cooling 5-7 years after the deposits of Eastern Turkmenia go into operation.

Investigations of the condition of the gas fed into the key gas pipelines from fields of the Turkmengazprom, carried out at the Turkmen Affiliate of the All-Union Scientific Research Institute of the Gas Industry, indicated that the dew point of gas in a number of cases does not correspond to the requirements of the branch standard. The increased gas dewpoint values are a consequence of the noncorrespondence of the actual technological regime of the fields to the regime provided for in the project.

The principal factor making difficult the maintenance of the projected technological regime in NTS apparatus is the absence of the required pressure drop in the connecting piece.

An analysis of multisided geophysical investigations of boreholes situated over the entire area of the productive horizon indicated that the gas-supplying intervals vary in the range of 10-50% of the effective thickness, on the average being 35%. Accordingly, the depressions on the stratum are twice as great as planned.

At the present time specialists at the association are carrying out an insistent search for effective methods for the industrial preparation of gas; work is being completed on the construction of two ammonium-hydroxide cooling apparatuses for the artificial cooling of gas in the Naip and Gugurtli deposits.

In order to solve the problem of the practical use of tubular gas expansion machines in the technological installations of the NTS work is proceeding on experimental-industrial tests of tubular gas expansion assemblies of the type BTDA-5-100-1 KhL1 in the Kirpichli and Vostochnyy Shatlyk gas-condensate deposits.

Positive results of the tests will make it possible to reduce by several times the capital expenditures on the construction of cooling plants. In addition, with the use of these apparatuses it is possible to achieve a complete automation of the process.

The Shatlyk deposit of gas condensates contains up to 92% paraffin-cycloparaffin hydrocarbons, of which more than 50% is accounted for by alkanes of an unbranched structure having a high solidification point. This with the use of the throttling effect worsens the ability of the apparatus to recover due to the deposition of hard particles on the surface of the heat exchanger. The worsening of heat exchange is also attributable to the adhesion of the corrosion inhibitor on the internal surface of the heat exchange tubes.

In the course of operation other factors complicating the industrial preparation of gas were also established. For example, at the Achak deposit, despite the fact that the rate of gas flow in the separators is five times less than that which is admissible, it is impossible to achieve a total trapping of the fluid. The reason for this is a design imperfection of the vertical gravitational separators. In order to enhance the effectiveness of extraction of fluid from the gas at the output from the UPPG-1, 2, 4, direct-flow separators designed at the Ukrainian Scientific Research Institute of the Gas Industry with Teflon filter packets were additionally installed in the Severnyy Achak area. This made it possible to increase the effectiveness of separation by a factor of 2.

The separation equipment at key structures of the Achak deposit was reconstructed and modernized: absorbers with bubble plates, operating in a regime of a gravitational separator, were reoutfitted into columns with spherical packings. The free cross section of the grids was 45%, the distances between them was 1200 mm and the static height of the layer of packings was 175 mm. The construction of the packings and the reconstruction of the columns were accomplished in accordance with the reconstruction project and working diagrams developed by the All-Union Scientific Research and Production Institute of the Gas Industry.

In the fields where DEG is used as the inhibitor of hydrate formation, the technical projects for their reoutfitting provide for a definite degree of dilution of the DEG by condensation water (not more than 10%). On the basis of a stipulated concentration of DEG saturation it was possible to design apparatus

for the regeneration of DEG (their number, handling capacity). When the planned degree of DEG dilution is exceeded the DEG regeneration apparatus is overloaded and as a result the required concentrations of regenerated DEG are not attained, which in turn reduces the moisture capacity of the DEG working solution and this results in a deviation of the technological regime from the stipulated parameters.

In order to study the reasons for the excessive dilution and clarify the patterns of this phenomenon it is of great practical interest to investigate the effectiveness of operation of the separators under the conditions in the Shatlyk deposit.

Two types of separators were used in the exploitation of this deposit: centrifugal adjustable separators mounted on UPPG and the first stage of the GS and gravitational separators with a mesh element mounted on the GS for the final purification of gas prior to its being fed into the main gas pipeline.

The technical specifications OST 26-02-645-72 established the degree of gas purification (with a fluid content in the gas up to 200 $cm^3/m^3$) by centrifugal adjustable separators -- not less than 98%, and with mesh separators -- not less than 99%. Investigations of separators with mesh elements indicated that they give good purification of the gas from droplet fluid.

Experiments for determining the quantity of removal of water and establishing the effectiveness of operation of the centrifugal adjustable separators for water were carried out initially by the monitoring of the saturation of DEG fed into technological lines and then tests (in collaboration with the TsBKN) were carried out with an evaluation of the effectiveness of the operation of the separators for fluid as a whole. A comparative evaluation of the two methods indicated that with high velocities of the gas at the site of installation of the probe the fluid content is about 0.5-10 $cm^3/m^3$ and the final results of the investigations agree well with one another.

The investigations involved two modifications of the TsRS separators: separators of the GP-85.03.000 series and separators of the GP-374.03.000 series. In the latter the height of the separation chamber has been increased to 1600 mm. Prior to the investigation the apparatus was subjected to inspection and irregularities were eliminated. The distance between the movable and fixed cones was set in dependence on the operating regime of the apparatus.

The apparatus for the first stage of the GP-85.03.000 series was tested with loads from 5.2 to 3.2 million $m^3$/day. Analysis of these data indicated that the quantity of removal of the fluid from the apparatus can vary from 2 to 7 $cm^3/m^3$ and is dependent on the loading of the apparatus, the quantity of fluid entering into it and the presence of surface-active substances.

The relatively greater removal of condensate relative to the elimination of water is evidently attributable to the fact that the density and magnitude of surface tension of water, relatively greater in comparison with the condensate, favor the formation of large drops and facilitate their separation.

Investigations have indicated that whereas with a loading of 5 million $m^3$/day the efficiency of the primary separator is 79% for water and 55% for condensate, with a loading of 3 million $m^3$/day the efficiency for water is 98% and for condensate 88%. It has also been established that with a decrease in the quantity of fluid, especially with high loadings, the efficiency is reduced.

At the Shatlyk deposit, in order to protect gas industry equipment against corrosion, the KO corrosion inhibitor in the form of a 3% solution in the condensate or an aqueous VZhS solution is fed to the borehole face through the space outside the pipes. An analysis of the samples of fluid entering the separator and flowing from it indicated a difference in the content of the corrosion inhibitor in them in the droplet fluid emerging from the apparatuses, which confirms the redistribution of the corrosion inhibitor in the separation process. This indicates the presence of a foam layer, in whose boundary the corrosion inhibitor is sorbed. The latter, being a residual product of the production of surface-active substance, itself has the indicated properties.

The presence of substances having surface-active properties itself has a negative influence on the efficiency of operation of the separators, which is attributable to a decrease in the surface tension of the gas-fluid system, and as a result, a decrease in the size of the fluid particles in the gas. Thus, the presence of the KO corrosion inhibitor in the gas condensate mixture to a definite degree exerts an influence on the decrease in efficiency of apparatus operation. The use of the new IKIPG inhibitor, having an amine base, precluded the mentioned undesirable effects.

In order to clarify the ways to broaden the range of effective operation of the separators we carried out tests of several modernized variants. The simplest method for increasing the efficiency of operation of the centrifugal adjustable separators was an increase in the height of the separation chamber. Another possible means is the modernization of the design of the unit for elimination of gas from the separation chambers: in one case a special jalousied cap on the exit pipe was used for this purpose; in another case part of the gas flow was sucked from the separation chamber through the exit pipe of the connecting piece, whose free end entered the gas cavity of the separation section of the apparatus.

The absolute quantities of fluid eliminated from the separator and also the efficiency of operation of the separator obtained with different conditions of its operation indicate that the greatest efficiency is observed with operation of an apparatus outfitted with a cap and jalousied cap with suction of a part of the gas flow from the separation section of the apparatus.

Under the indicated conditions the efficiency of separation with a planned load of 5 million $m^3$/day was 98% or more for water, for condensate -- about 81-83%, that is, the practical modernization of the separator made it possible to increase the efficiency of separation by 19% for water and by 26-28% for condensate.

Since the results reflect clearly the separation process under conditions precluding the possibility of using the lower section of the apparatus for its intended purpose as a container for the preliminary separation of the fluid the

tests of the apparatus were made with the maintenance of the fluid in the separation container at the level of its averaging filling with the planned level of the fluid at the height of the condensate compartment partition.

In the absence of a jalousied cap and closing of the built-in connecting pipe the efficiency of the apparatus is comparable with the values obtained during operation of an unmodified apparatus of the GP 374.03 series, which indicates an insignificance of the effect from the supplementary outfitting of the separation chamber of the apparatus with a cylindrical attachment.

An analysis of the results makes it possible to recommend an apparatus supplied with such an attachment and a jalousied cap with suction of part of the gas flow with a minimum admissible level of the fluid in the collection container as the optimum variant ensuring an increase in the effectiveness of the apparatus.

During the initial stage in working of the deposit there was a frequent disruption of operation of the system for automatic elimination of the fluid from the separators due to malfunctioning of the ball-type level gages, which has substantially reduced the effectiveness of the installed separation equipment. The broad introduction of fundamentally new types of the level gages in the Turkmengazprom facilities, based on radiation monitoring of the fluid level and the use of valves with a large cross section, made possible a considerable increase in the reliability of the system for the elimination of fluid.

Interesting work for increasing the quality of industrial preparation of the gas has also been performed by the All-Union Scientific Research and Production Institute of the Gas Industry: intrapipe separation of gas, reconstruction of the absorbers on the GS of the Achak deposit with their filling by polypropylene spheres.

In the Kirpichli, Naip and Shatlyk deposits, on the proposal of the Turkmen Affiliate of the All-Union Scientific Research Institute of the Gas Industry, work is being done on the preparation of a scheme for the introduction of the process of intrapipe sorption of gas by the condensate. According to preliminary data, introduction of the method will make it possible to decrease the gas dew point for hydrocarbons (when it is impossible to obtain low temperatures in the NTS) and increase the degree of removal of the condensate from the gas.

During the current five-year plan the advancing rates of growth of the fuel-energy branches of industry, including the gas industry, will be maintained. The planned level for gas production at the "Turkmengazprom" Production Association will also be attained by the putting of tens of new deposits into operation.

During the 11th Five-Year Plan a qualitatively new stage has begun in the exploitation of the natural treasures of gas in the republic -- the output of gas from deposits containing sulfur with the production not only of condensate from the gas, but still another valuable item, pure sulfur. By the end of the 11th Five-Year Plan four other gas deposits will be in work.

The measures provided for in the multisided-purposeful program of the association for 1981-1985 can make possible a substantial improvement in the quality of industrial processing of gas and at the overwhelming majority of deposits will ensure a condition of the gas corresponding to the branch standard.



5303
CSO: 1822/16

SYNOPOSES OF ARTICLES FROM 'AZERBAIJAN PETROLEUM INDUSTRY' -- NOS 6 AND 7, JUNE AND JULY 1982

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 6, Jun 82, pp 63-64; No 7, Jul 82, pp 63-64

No 6

UDC 556.98:550.8.01(479.24)

## NEW DATA ON GEOLOGY AND PETROLEUM AND GAS RESOURCES OF LOWER PT HORIZONS OF KYUROVDAG AND KARABAGLY DEPOSITS AND DIRECTION FOR FURTHER EXPLORATION WORK

[Synopsis of article by Z. M. Ibragimov, pp 1-3]

[Text] The article generalizes the results of geological prospecting work carried out during recent years in the lower PT horizons of the Kyurovdag and Karabagly deposits. New data are given on their petroleum and gas resources and geology. For the first time it has been possible to construct a structural map of the Kyurovdag and Karabagly deposits using a regional reference at the bottom of PT horizon XVII in accordance with the Kyurovdagskaya layout. Recommendations are given on the directions of geological prospecting work with the drilling of exploratory boreholes. 3 figures.

UDC 552.5:622.24(574.5)

## INFLUENCE OF LITHOLOGICAL-MINERALOGICAL CHARACTERISTICS OF ROCKS ON CONDITIONS FOR DRILLING OF BOREHOLES IN STRUCTURES OF EASTERN PART OF APSHERONO-PRIBALKHANSKAYA TECTONIC ZONE

[Synopsis of article by M. B. Kheirov, N. Yu. Khalilov and E. S. Balayev, pp 4-9]

[Text] The article gives the results of investigation of the lithological characteristics of Pliocene and post-Pliocene rocks of this region and their relationship to complications arising during the drilling of boreholes. It was established that there is a definite pattern in the distribution of different types of complications in the section which can be used for their prediction and prevention. 2 figures, 1 table, 7 references.

PROSPECTS FOR FINDING PETROLEUM AND GAS IN CRETACEOUS DEPOSITS OF SOUTHEASTERN PART OF GREATER CAUCASUS MEGANTICLINORIUM

[Synopsis of article by A. M. Gurbanov, pp 9-12]

[Text] It was established that an increase in the content of bitumen, improvement in facies composition and collector properties and an increase in the thickness of Cretaceous deposits is noted from west to east within the limits of the basin of the Girdymanchay River where the Khimranskaya structure is evaluated as the most promising in the search for petroleum-gas deposits. The directions for geological prospecting research are defined. Recommendations are given on the drilling of parametric and structural-exploration boreholes. Recommendations are given on the carrying out of complex geophysical studies. 1 figure, 6 references.

LITHOLOGICAL STRUCTURE AND PETROLEUM AND GAS RESOURCES OF PT HORIZONS V AND VII OF NORTHEASTERN WING OF BULLA-MORE DEPOSIT

[Synopsis of article by Sh. A. Suleymanov, T. I. Abdullayev, G. Sh. Vartapetyan and V. Ye. Grigor'yan, pp 12-15]

[Text] On the basis of electrometric investigations it was possible to correlate sandy layers and strata V and VII in PT horizons. The upper 5 layers and strata of horizon V are not saturated with hydrocarbons, whereas the lower layers contain several commercially saturated formations of different degrees of productivity, including one formation which contains a petroleum margin of small extent. All the sandy layers and strata of horizon VII are saturated and are characterized by high yields. The horizon is regarded as a single formation to be worked, subject to simultaneous information for the entire petroleum-saturated strata. 4 figures, 1 table.

UDC 622.24.001.2.002:550.832

NEED FOR ALLOWANCE FOR TEMPERATURE DIFFERENCES IN ROCK MASSES AND ZONES SURROUNDING BOREHOLES IN INTERPRETATION OF COMMERCIAL GEOPHYSICAL DATA

[Synopsis of article by E. N. Dergunov, pp 15-21]

[Text] The temperature of rocks in boreholes which are being drilled varies not only vertically, but also in a radial direction from the borehole shaft, at one and the same measurement depth introducing different distortions into the apparent electrometric parameters due to a change in the radii investigated by the logging probes. Temperature curves of the near-shaft zones of boreholes which are being drilled and rock masses were constructed; these can be used in applying the method for determining the influence of the radial change in temperature on the parameters measured in boreholes. Under conditions of considerable excesses of the anomalously high pressures of fluids in clayey sectors over the stratum pressures of the collectors the lateral logging method, making it possible to make measurements at the maximum research radii is the principal method for determining the nature of saturation of the collectors. 3 figures, 2 tables, 8 references.

UDC 622.275.2/3002.20

SOME PROBLEMS IN WORKING SANGACHALY-MORE-DUVANNYY-MORE-BULLA ISLAND DEPOSIT

[Synopsis of article by R. N. Aliyev, pp 22-23]

[Text] It was determined that the predominant influence on the petroleum yield of the horizon under conditions of different geological-physical peculiarities of the blocks is exerted by the rates and nature of use of stratum pressure. With an increase in the area of petroleum yield of the block the rates of petroleum yield, and accordingly the degree of exploitation of the petroleum reserves decrease, all other conditions being equal. This confirms the need for establishing the optimum density of operational units for each block, taking into account their geological characteristics and current energy state. 3 figures, 2 references.

UDC 622.245.12:531.787

DETERMINING DIAMETER OF OPENING OF NON-RETURN VALVES OF CASED COLUMNS

[Synopsis of article by E. M. Suleymanov and Kh. Ya. Rashidov]

[Text] A study was made of the problems involved in regulating hydrodynamic pressure when lowering cased columns with use of regulating non-return valves. On the basis of an investigation of the change in hydrodynamic pressure, with allowance for the lag in removal of the mud from the boreholes, it was possible to derive formulas for determining the diameter of the opening in the non-return valve, and on this basis nomograms were constructed. In addition, the authors propose a change in the throttling part of the TsKOD for the purpose of using detachable fittings. 4 figures, 3 references.

UDC not given

EXPERIENCE IN INSULATING ABSORBING ZONES OF SALT KARST

[Synopsis of article by N. M. Makeyev, pp 27-30]

[Text] The article describes the geological, geophysical and hydrodynamic characteristics of the zone of absorption of salt karst. The author presents information on the development, validation and effectiveness of use of magnesian polyacrylamide cement paste for eliminating absorption in zones of halogen rocks. 2 figures, 1 table, 5 references.

UDC 622.248:622.24.082

REDUCING PRESSURE DROPS IN COURSE OF DRILLING OF SANDY-SILTY HORIZONS AND SUITES IN BAKINSKIY ARCHIPELAGO AREAS

[Synopsis of article by A. P. Ismaylov and P. G. Mekhtiyev, pp 30-33]

[Text] On the basis of experience in carrying out deep reconnaissance-exploration drilling work it is shown that there is a negative influence of the drop between the stratum and hydrostatic pressures of the mud on the penetration

of boreholes during the drilling of permeable horizons. Actual data are given on experiments for reducing the pressure drops in a number of boreholes. There has been an improvement in borehole technology and an increase in the technical-economic indices of drilling. 1 figure, 2 references.

UDC 622.243.23

EFFECTIVE PARAMETERS OF TURBODRILL WHEN DRILLING SLANT BOREHOLES

[Synopsis of article by N. A. Grigoryan, pp 33-36]

[Text] The author proposes a method for determining the effective parameters of a turbodrill and the axial load on the bit during the drilling of slant and vertical boreholes, taking into account the deflecting force on the bit, the frictional moment in the radial bearings of the turbodrill, the regimes of bit operation and the axial support of the turbodrill. 1 table, 7 references.

UDC 622.276.5:658.018.2:621.671

OPTIMIZING CHOICE OF CENTRIFUGAL ELECTRIC PUMPS WITH ALLOWANCE FOR RELIABILITY OF LOWERED EQUIPMENT FOR OIL WELLS OF AZNEFT' ASSOCIATION

[Synopsis of article by B. A. Azimov and D. M. Kremer, pp 37-39]

[Text] The authors ascertained the dependence of the frequency of malfunctioning of different kinds of lowered UETsN (electric centrifugal pump) equipment on the depth of pump suspension. It was possible to establish a dependence between the interrepair period of a borehole operated by means of an electric centrifugal pump and the depth of lowering of the pump. 2 references.

UDC not given

DETERMINING HYDRODYNAMIC PARAMETERS OF STRATUM FROM CURVES OF BILATERAL RESTORATION OF FACE PRESSURE

[Synopsis of article by S. D. Mustafayev, pp 39-41]

[Text] Methods for determining the hydrodynamic parameters of a stratum are proposed on the basis of curves of bilateral restoration of pressure using solutions of the nonstationary problems of filtering of incompressible viscoplastic fluids from a bandlike stratum to a gallery, from a circular stratum to a borehole and from a hemispherical deposit to a borehole. It is recommended that the results of field investigations be processed using the lower curve of pressure restoration. 2 figures, 7 references.

UDC 621.791.011:539.3

DECREASE IN RESIDUAL WELDING DEFORMATIONS IN CONSTRUCTING OUTER LEG SUPPORTS OF STATIONARY PLATFORMS

[Synopsis of article by Z. M. Tairli, A. V. Asplund, V. M. Mamedov and M. N. Gadzhizalov, pp 42-44]

[Text] The authors give the computed value of the admissible angular deviation of the corner plate with adherence to the admissible gap and also a qualitative evaluation of different variants of the sequence of assembly and welding of the unit. The article gives the results of experimental studies for a quantitative determination of deformation of the corner plate for in situ units -- samples of outer supports. The advantage of the selected variant, reducing the arising gap by a factor greater than 3, is demonstrated. 3 figures, 1 table, 3 references.

UDC 532.517

COMPUTING CURRENT VELOCITIES OF DIFFERENT PROBABILITIES IN AREAS OF MARINE PETROLEUM- AND GAS-BEARING DEPOSITS OF CASPIAN SEA

[Synopsis of article by T. D. Khudaverdiyeva, pp 44-46]

[Text] Observations of currents made over a period of many years were processed and analyzed by the methods of the theory of probabilities and mathematical statistics. It is demonstrated that the current distribution at the sea surface is described well by the Weibull law. A nomogram is developed for computing current velocity of any probability. 2 figures, 8 references.

UDC 621.892.8.088.8

INVESTIGATING PROTECTIVE PROPERTIES OF SOME SULFONATE ADDITIVES

[Synopsis of article by K. I. Sadykhov, A. N. Agayev, S. M. Veliyeva, et al.]

[Text] The article gives the results of an investigation of the protective properties of sulfonate additives which demonstrated the high effectiveness of neutral sulfonates in comparison with highly alkaline sulfonates. A correlation was established between the protective properties of the sulfonate additives and their capacity to counteract the wear of working surfaces. 4 tables, 2 references.

UDC not given

HYDROCARBON COMPOSITION OF BIBIEYBATSKAYA LIGHT PETROLEUM OF UPPER FORMATION

[Synopsis of article by G. G. Ashumov, R. M. Agayeva, F. Z. Aliyeva, et al.]

[Text] The authors give the results of study by a complex method of the hydrocarbon composition of 20° fractions boiling away in the range 150-450°C in

Bibieybatskaya light petroleum. It was established that the main mass of the studied petroleum consists of naphthene hydrocarbons, among which monocyclic hydrocarbons predominate over bi- and polycyclic hydrocarbons. Paraffin hydrocarbons of isomeric structure are second in content; no formations with a normal structure were discovered. Aromatic hydrocarbons are present in the investigated petroleum in a minimum concentration. The absence of paraffins of a normal structure, the high content of naphthene and isoparaffin hydrocarbons with a low concentration of aromatic hydrocarbons, makes it possible to obtain high-quality motor fuels and lubricating oils from the investigated petroleum without use of the dewaxing process. 3 tables, 3 references.

UDC not given

INTRODUCTION OF SCIENTIFIC WORK ORGANIZATION AS IMPORTANT LINK IN WORK CONTROL SYSTEM

[Synopsis of article by D. A. Kaziyev, G. G. Rzayev and R. V. Urumyan, pp 53-58]

[Text] On the basis of an analysis of activity of the Azneft' Association in the field of development and introduction of measures for the scientific organization of work during the years of the Tenth Five-Year Plan the authors describe the most effective forms and methods for work under the scientific organization of work scheme finding use in the enterprises of the association. Taking into account the prospects for development of the program under the scientific organization of work scheme in the years of the 11th Five-Year Plan, the article outlines specific ways to improve the work of the Azneft' Association as a whole. 2 tables.

No 7

UDC 553.98.044:622.276.24

PROSPECTS FOR FURTHER DEVELOPMENT OF KIRMAKINSKAYA SUITE OF SOUTHWESTERN APSHERON

[Synopsis of article by D. E. Zeynalov, pp 1-4]

[Text] The author discusses the degree of exploitation of petroleum reserves in an enlarged cross section of inhomogeneous KS strata in southwestern Apsheron. It was established that the reserves of KS petroleum in southwestern Apsheron both in area and in thickness, as a result of the absence of an independent schedule for the development of boreholes and the energy characteristic for the deposit (predominance of a dissolved gas regime), have been worked out to a considerable degree to a nonuniform extent. Recommendations are given for the purpose of increasing the final petroleum yield by the drilling of 8 new and the restoration of 8 boreholes removed from production. 1 figure, 1 table, 2 references.

UDC 552.52(479.24)

## REASONS FOR LOW FILTRATION PROPERTIES OF KARABAGLY PT ROCK COLLECTORS

[Synopsis of article by M. B. Kheirov, E. A. Daidbekova and F. M. Kurbanova, pp 4-8]

[Text] The authors clarify the reasons for the poor permeability of the PT rock collectors of the Karabagly deposit. A detailed lithological-petrographic investigation of the sandy-silty PT rocks of this area indicated that one of the principal reasons for the low permeability of these rocks is the widespread development of authigenic mineral formations (montmorillonite, calcite, chlorite, etc.) in the cement, leading to complications in the structure of the pore space and a narrowing of filtration channels. 3 figures, 2 tables, 3 references.

UDC 553.982

## EXPERIMENT IN DETERMINING PERMEABILITY OF TECTONIC DISLOCATIONS

[Synopsis of article by M. A. Minchuk, pp 8-12]

[Text] On the basis of hydraulic probing of boreholes in the Surakhanskoye and Kalinskoye petroleum deposits the author proposes a method for determining the limit of decrease in stratum pressure. The conclusion is drawn that there is a need for a more detailed study of the physicomechanical properties of clayey components and allowance for these when planning the development of petroleum deposits and also a need for carrying out hydraulic probing in all stages of working of the deposits. 5 figures, 1 table, 3 references.

UDC not given

## EXPERIMENTAL STUDIES OF HYDROGEN SULFIDE EFFECT ON QUALITY OF CEMENT SOLUTIONS AND ROCKS

[Synopsis of article by R. M. Khasayev, V. I. Fedorenko and Ya. G. Mamedov, pp 13-16]

[Text] The article describes experimental investigations of the influence of a hydrogen sulfide medium on the rheological parameters of cement solutions and the mechanical properties of samples of cement stone. It is established that under the influence of hydrogen sulfide the parameters of the cement solution change considerably, there is a reduction of the strength characteristics and an increase in the gas permeability of the cement rock. Also described are the results of investigations for preventing the harmful influence of hydrogen sulfide on the quality of cementing by the introduction of different neutralizing additives into the plugging materials. 3 figures, 1 table, 4 references.

UDC 622.245.422.6

PRODUCTION OF LIGHTENED MUDS

[Synopsis of article by M. Kh. Agayev, D. T. Ambartsumova and E. K. Yusifzade, pp 16-19]

[Text] The article gives the results of investigations confirming the possibility of obtaining lightened muds by the introduction of fragmented foam plastic. Detailed information is given on the influence of different factors on the stability, maintenance of pumpability and plugging possibilities of the lightened muds. 2 figures, 2 tables, 4 references.

UDC not given

INVESTIGATING LATERAL COMPONENT OF ROCK PRESSURE IN CLAYEY AND SALT-BEARING DEPOSITS

[Synopsis of article by L. Ye. Simonyants, V. N. Romashov and G. R. Vlasov, pp 20-22]

[Text] A method is proposed for laboratory investigations of the lateral component of rock pressure in clayey Maykop and salt-bearing deposits. The graphic dependences which were obtained indicate a considerable influence of stratum conditions on the lateral component of rock pressure. 3 figures, 4 references.

UDC 622.24.062:661.84.23

EVALUATING COHESION OF CLAYEY ROCKS

[Synopsis of article by M. A. Khanmamedov, pp 24-28]

[Text] The author gives the experimentally determined analytical dependence of the strength of clayey samples on the dielectric constant of the fluids acting on them. It is shown that the derived equations, consisting of dimensionless parameters and characteristics, are criterial. The decisive criterion in the equations is the K factor characterizing the type of structural bonds in clays. The determination of the similarity criterion K for natural clayey rocks and its reproduction during the modeling of artificial samples makes it possible to investigate the physicochemical factors of stability of clays during interaction with fluids. 2 figures, 1 table, 9 references.

UDC 622.270.1(479.24)

WORKING OF MURADKHANLY DEPOSIT

[Synopsis of article by B. A. Gadzhiyev, A. M. Pirverdyan and G. M. Miriyev, pp 29-32]

[Text] In accordance with probability theory, the authors give the formulation and solution of the problem of the probability of opening of vertical fractures

by slant boreholes with a stipulated density of distribution of fractures. The proposed method is illustrated in the specific example of the Muradkhanly deposit, taking into account its specific geological characteristics and an analysis of the results is given from the practical point of view. 1 figure, 4 references.

UDC 622.276.652.001

DESIGNING OF BOREHOLE FOR PUMPING HEAT CARRIER INTO STRATUM

[Synopsis of article by L. M. Matveyenko, pp 32-36]

[Text] The article describes the design of a heat-injection borehole ensuring a substantial decrease in the loss of heat from the borehole into the surrounding rock mass and reliable thermal protection of the encased column. 3 figures, 1 table, 7 references.

UDC 621.643

COMPUTING PRINCIPAL PARAMETERS OF LAYING OF PIPELINES WITH DIAMETERS 219-529 mm WITH SEA DEPTHS UP TO 200 m FROM 'SULEYMAN VEZIROV' PIPE-LAYING BARGE

[Synopsis of article by G. A. Mekhtiyev, A. R. Vezirov and A. T. Ismaylova, pp 37-41]

[Text] The constructed graphs for different sea depths and pipeline diameters make it possible to ascertain the principal laying parameter -- the angle of meeting of the pipeline with the shore point, which predetermines the possibility of laying of the pipeline at the intended sea depth. The computations show that the most dangerous segment with respect to stresses is the upper bend of the pipeline, that is, the segment of curvature of the pipeline near the shore point and also that the pipeline can break due to overstress only at its emergence from the shore point. 4 figures.

UDC 624.042.4:627.2

NOMOGRAM FOR COMPUTING MEAN ANNUAL NUMBER OF WAVES IN ABYSSAL PARTS OF SEA

[Synopsis of article by A. A. Israilov, pp 41-43]

[Text] The author has developed a general scheme for computing the number of waves at a definite point in the abyssal part of the sea. On the basis of long-term data on the frequency of recurrence of wind-induced flows in the sea by directions and velocities (in days) it was possible to compute the mean annual number of waves in the abyssal part of the sea. A nomogram was developed for computing the number of waves of different probabilities. 1 figure, 2 tables, 5 references.

UDC 547.533:661.183.6

DISPROPORTIONATION OF TOLUENE ON Co-FORMS OF ZEOLITE OF U TYPE MODIFIED BY PALLADIUM AND COBALT

[Synopsis of article by B. A. Dadashev, A. A. Sarydzhanov, S. E. Mamedov, et al., pp 44-46]

[Text] The results of investigation of the disproportionation of toluene on zeolites in a polyvalent cation form, additionally modified by palladium and cobalt, are given. It is shown that with modification of zeolite catalysts by palladium in most cases the dealkylation of toluene will occur. The additional introduction of cobalt into the Co-form of zeolite facilitates the disproportionation of toluene and makes it possible to stabilize the activity of the catalyst. 1 figure, 1 table, 5 references.

UDC 547.533:661.183.6

METHOD FOR DETERMINING THE DISTRIBUTION LAW OF EMULSIFIED WATER FOR DROPLET SIZES AND ITS CHARACTERISTICS IN PETROLEUM PREPARATION PROCESS

[Synopsis of article by A. G. Rzayev, pp 46-48]

[Text] A study was made of the problem of determining the disperse composition of a petroleum emulsion in the petroleum preparation process. A method has been proposed which on the basis of experimental data makes it possible to establish the law of distribution of emulsified water for droplet size and make a quantitative evaluation of its parameters. The article gives specific results and it is shown that for the investigated apparatus the distribution of emulsified water droplets conforms to the normal law. 1 figure, 5 references.

UDC not given

INVESTIGATION OF PROCESS OF ADSORPTION OF n-PARAFFIN HYDROCARBONS ON CaA AND MgA ZEOLITES

[Synopsis of article by R. A. Bagirov and N. I. Nabiyev, pp 48-50]

[Text] The results of investigations of the adsorption characteristic of CaA and MgA zeolites produced at Groznyy are given. It was established that with an increase in temperature from 100 to 250°C the adsorption capacity of CaA and MgA zeolites for the n-paraffins $C_5$-$C_8$ decreases by approximately 40%. A study was also made of the influence of temperature on the activity of fresh and used CaA zeolite. It was established that after 20 cycles the difference in activity when working with fresh and used zeolite is approximately 50%. 3 figures, 3 references.



5303
CSO: 1822/17

## RAIL CARS FOR HAULING SPENT NUCLEAR FUEL IN CEMA NATIONS DESCRIBED

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 11, 1982 pp 21-24

[Article by Aleksandr Panasenkov, section manager of the CEMA Secretariat, and Vsevolod Tolpygo of the CEMA Secretariat: "Problems of Transporting Spent Nuclear Fuel from AES's"]

[Text] Spent fuel unloaded from nuclear reactors is subject to regeneration (reprocessing) with a view to extracting therefrom and returning to the cycle fuel that is not completely expended and obtaining radioactive isotopes that are valuable to the national economy.

This processing is complicated and expensive, and it is not economically desirable to organize it at each AES. It is performed centrally at special radiochemical plants. Still another important problem arises here--hauling the fuel from the AES's to these plants. This should be solved in integrated fashion with an eye to improving safety and economic effectiveness.

Nuclear fuel has specifics that distinguish it from other dangerous freight. This is occasioned by the fact that tvel [fuel element] assemblies, even after being held in AES storage ponds, have a high level of radiation, and they can be transported only in containers with heavy walls, which afford biological protection.

Containers of this type are metals-intensive, their weight reaching 100 or more tons, and their cost is high. This, plus the fact that the proportion of fuel being hauled at one time in the container is only about 2-5 percent of the container's total weight, tells considerably not only on transporting costs but also on the total cost of the electric power being generated.

Under such circumstances the main task is to achieve maximum savings in hauling, primarily by creating rational and inexpensive container structure. The design should take into account high reliability and safety of hauling, which are organically associated with the striving throughout the whole world for greater protection of the environment from contamination.

As analysis indicates, the greatest economic benefit can be obtained by integrated solution of the following problems:

increasing the amount of fuel hauled at one time;

reducing the turnaround time for the transport equipment; and

unifying calculations, documentation and so on to the maximum.

The first of these can be solved with greater volumetric capacity of the transport equipment. Yet increase in its dimensions and weight is limited. For rail transport, this results from the shape and dimensions of the railroad tracks, the distances between neighboring tracks, the height of bridges and electric-power lines, and the radii of curves and turns. In considering all this, container cars cannot exceed 3.75 meters in width and 5.3 meters in height in the USSR, or 3.15 and 4.65 meters, respectively, in the other CEMA member countries. Restrictions of a similar nature hold also for other types of transport.

The containers that exist today have been built practically to the indicated limits or close to them. This means that new constructional materials should be used. They should, with the least thickness, provide the same biological protection, and, moreover, possess adequately high heat conductivity and strength properties at low and high temperatures.

Today lead and naturally occurring uranium possess such qualities. The wall thickness of containers made of uranium and of lead and steel is commensurate with the ratio 1:2:4. The use of new materials will enable container capacity to be increased 50 percent without an increase in weight. However, doing so is fraught with definite difficulties. Both materials, by virtue of their specific properties, require continuous lining. Therefore, specific computations must be performed here.

The second important element in raising economy of hauling is reduction in the transport equipment's turnaround time. This can be achieved by:

the development and realization of optimal hauling schemes;

an increase in speeds;

an increase in load capabilities of the transport equipment;

a reduction in the time for auxiliary operations (loading, unloading, repair, deactivation work, monitoring of operating parameters and radioactive pollutants, and so on); and

organizational measures.

Calculations indicate that hauling takes up only 10-20 percent of the total time for use of transport equipment. Consequently, a rise in turnaround capability can be achieved basically by reducing nontransport operations.

In order to achieve maximum economy in hauling, reliability and safety of hauling must also be assured, both under normal conditions and in case of emergencies.

Today special importance is attributed throughout the whole world to increasing safety in transporting spent nuclear fuel. The reason is the steady growth in the number of AES's, and, as a consequence, increase in the intensity of spent-fuel hauling. This, as well as the necessity in the very near future of transporting

fuel that is high in residual energy release, specific activity and intensity of neutron flux (including fuel from breeder reactors), require the solution of increasingly complicated technical and organizational problems. One of these is an increase in the strength and reliability of the packaging unit structure.

A review is now being made of the Rules for Safety in Hauling Radioactive Substances that MAGATE [the International Atomic Energy Agency] has adopted. The prerequisites for thermal tests and the criteria for sealing have been refined. Additional requirements for hauling by water and by air are called for. Programs that guarantee quality during the manufacture and operation of the packaging units that are being introduced in certain countries serve to increase reliability. In analyzing a container for strength, the effect on it of a 15-meter column of water (in imitation of dropping the container to the bottom of a river or other water body), of freezing temperatures (-40 degrees C. in case of transport during the winter) and of thermal shock (when dropped into cold water) should be considered.

Welded joints, whose impact strength is lower than that of the basic metal, are ordinarily more vulnerable in an emergency situation. Therefore, they require special attention during the design and analysis of containers for strength.

CEMA member countries are paying ever-increasing attention to improving reliability of the packaging units and to guaranteeing safety during spent nuclear fuel transport. This is caused by the fact that at present, and especially in the near term, a substantial growth in nuclear power engineering and an increase in hauling are contemplated. Experience indicates the correctness of the concepts adopted by the country today. They include:

the use of heavy-duty containers;

the application of special transport equipment; and

an orientation toward rail transport.

It is extremely economical and enables hauling in a single mode. This precludes the reloading of containers and the need to establish transshipment points, and, in the final analysis, it increases the safety of hauling. In some cases--where there are no spur tracks from the AES--spent-fuel containers are shipped to the railroad yard by truck or water transport. In this case, transport equipment specially outfitted for this purpose is used.

The use of heavy-duty containers reduces the intensiveness of hauling and also the labor intensiveness of operations at the AES's and processing plants. With increase in the dimensions of the containers, the weight of the "useful" load increases. And this unique efficiency factor of the container's useful work is a criterion of its effectiveness.

The CEMA member countries are performing research and are working out practical recommendations and measures within the framework of scientific and technical collaboration under the theme, "The Transporting of Spent Fuel Elements." Specialists of the fraternal countries have done significant work in recent years. A number of important basic documents have been prepared. They include the "Rules for the Safe Hauling of Spent Nuclear Fuel from Nuclear Electric-Power Stations of CEMA Member Countries. Part I. Hauling by Rail Transport, Specifications for Transporting Spent Nuclear Fuel by Rail and Water Transport, with Reloading into Railroad Cars" and other documents.

In accordance with plans for collaboration, a study of hydrogen accumulation, which occurs when water-filled containers transport spent nuclear fuel, is being completed. A methodology for analyzing the components of the gaseous impurity and evaluating the explosion hazard of water-filled containers which was worked out in the USSR has been confirmed experimentally. Research by the GDR is of great importance in determining optimal conditions for transport in gas-filled containers. The solving of these problems will enable better substantiation of choice of operating regimes for the packaging units when transporting spent fuel by the "dry" method.

The importance of the work of establishing standard procedures for heat and strength calculations of the transport packaging units and of developing programs for calculating their nuclear safety should be specially noted. Research is also being conducted in other fields. The USSR, for example, has developed TK-6 rail container cars for hauling spent fuel from AES's that have VVER-440's, and production thereof has started. In so doing, experience in their operation at the Novovoronezhskaya AES (USSR) and Rheinsberg AES (GDR) has been used.

Thermal and radiological tests of the TK-6 have been held in order to determine the heat regimes and protective properties of the packaging unit. They have enabled the range of its use and the conditions for hauling spent fuel in gas- and water-filled containers to be expanded.

A special train for TK-6 container cars that will enable simultaneous export of all the spent fuel from a VVER-440 has now been formulated. This train has already made several runs, including runs from the Kolskaya AES (USSR), the Kozloduy AES (BNR [Democratic Republic of Bulgaria]) and the AES imeni Bruno Leusher (GDR).

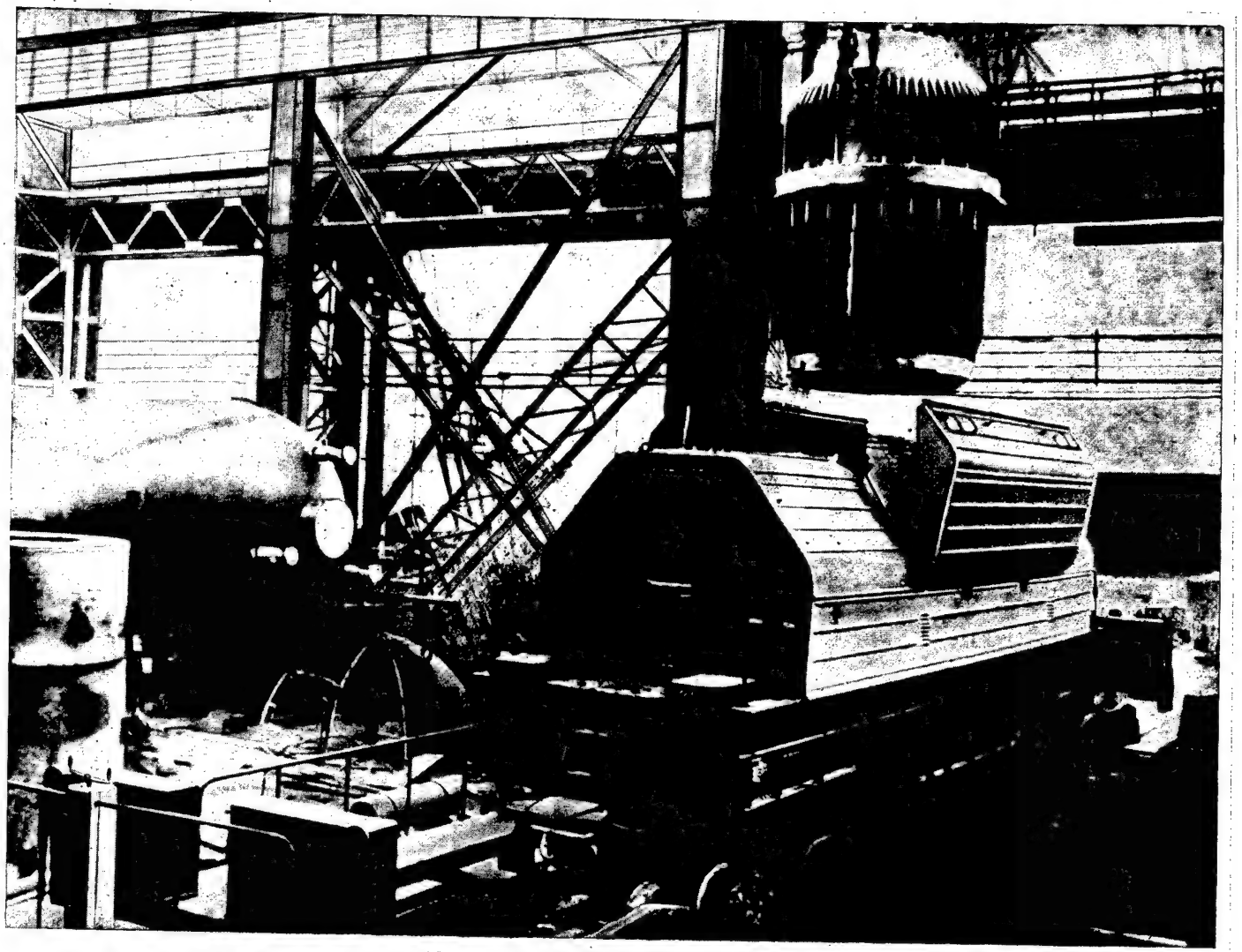
The creation of transport equipment for large-scale hauling from VVER-440's was one of the main areas of the collaboration of CEMA member countries during the preceding five-year plan. The accelerated growth of nuclear power in 1981-1985 poses a number of new problems. These are linked with the creation of the efficient transporting of fuel from VVER-1,000's.

The VVER-1,000 is a more recent development of vessel reactors with water under pressure. Its fuel assembly (TVS) is similar in design to that of the VVER-440. However, there are also differences, as is evident from the table.

Basic Characteristics of VVER-440 and VVER-1,000 Fuel Assemblies

| Characteristic | Unit of measurement | VVER-440 | VVER-1,000 |
|---|---|---|---|
| Length | mm | 3,217 | 4,570 |
| Cross-section dimension | mm | 144 | 234 |
| Number of fuel elements | ea | 126 | 317 |
| Fuel weight | kg | 136 | 488 |
| Maximum Uranium-235 enrichment | pct | 3.6 | 4.4 |
| Average designed burn-up fraction | hW· day/ton | 28.6 | 40.0 |

As we see, the main differences in the reactor TVS's are the dimensions and the initial enrichment of the fuel included in them. The latter also determines the greatest burn-up fraction. These peculiarities also occasion design differences in the packaging unit and the rail container car of the TK-10 from that of the TK-6.



Loading a Container of Spent Fuel into a Rail Container Car

The TK-10 is being developed to consider the requirements of the "Rules for Safe Hauling of Spent Nuclear Fuel from CEMA Member Country Nuclear Electric-Power Stations," which call for application of the rules established by MAGATE in 1973.

The TK-10 rail container car and the packaging unit for transporting spent fuel from the VVER-1,000 has the following characteristics:

| | |
|---|---|
| Rail container car dimensions: | |
| Length | 24,000 mm |
| Width | 2,940 mm |
| Height | 4,610 mm |
| Rail car weight | 90,000 kg |
| Weight of packaging unit loaded with a fuel assembly | 103,000 kg |
| Weight of the fuel hauled | 2,930 kg |

Along with the creation of the TK-10, an important area of collaboration within the CEMA framework during the current five-year plan is study of the transporting of spent fuel from AES's that have breeder reactors.

At the same time, work that was started in CEMA member countries during the last five-year plan on methods for monitoring the integrity of fuel elements that are subject to transport, on the criteria for rejecting assemblies as a function of the degree of their impairment, on creating unified cans for hauling assemblies with damaged fuel elements and specifications for transporting such assemblies, on research to determine the permissible thermal loads and maximum temperature for fuel elements when transported by the "dry" method, and so on, is being completed. Conclusion also of the work on structural materials for transporting packaging units must be speeded up. In so doing, special attention should be paid to the choice of materials and to reliable design for neutron protection. Simultaneously, generalization of the experience of transporting spent AES fuel--the basis for further improvement in organizing hauling and technical equipment--must continue.

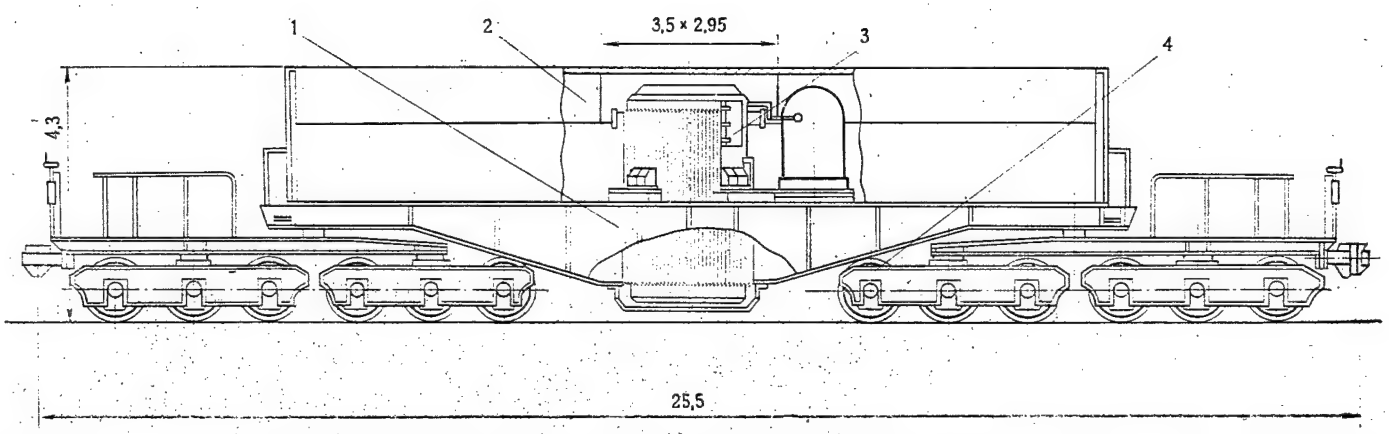
Work now being done by CEMA member countries on standardizing and technical guidance documentation has the goals of:

refining the provisos for transporting spent fuel from VVER-440's, taking the experience that has been gained into account;

working on the same tasks for the VVER-1,000; and

compiling standard procedures and programs for calculating the residual heat release of spent reactor fuel that operates on thermal and fast neutrons which are uniform for all CEMA member countries and will provide a precision that is higher than that of the standard procedures used today, as well as rules for providing for radiation safety during spent-fuel transport, implementation of the requirements for which will enable this safety to be raised.

Work to create light-weight easily decontaminated polymer coatings, and also to perfect designs for systems for sealing transport containers that will restrict the exit of the radioactive content into the environment is of great importance in reducing the time cycle for returning transport equipment and in increasing the economy and safety of the hauling.




Railroad Container Car (m) for Hauling Spent Fuel from an AES That Has VVER-440 Reactors

Key:

1. Transporter. 2. Covering. 3. Container. 4. Wheel pairs.

The successful solution by CEMA member nations of these most complicated scientific and technical problems will enable the reliability of the designs of the units and safety of spent nuclear fuel during international hauling to be raised still higher. The CEMA member nations' experience in scientific and technical collaboration is such that even these important problems can and will be solved successfully.



11409
CSO: 1822/100

## POOR INSPECTION PROCEDURES AT AES CONSTRUCTION SITES CRITICIZED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 5 Jan 83 p 1

[Article by M. Bulakov and N. Fedchenko, engineers from the Gorkiy branch of the Teploelektroproyekt Institute, and A. Ivanyuchenko, engineer from the Technical Inspection Point of the Rostovskaya AES: "Time Makes Us Hurry"]

[Text] The lights went out in the settlement. Everything was dark. As it turned out, there was an accident at the nuclear power station. An expert commission paid a visit on the following day. Scientists, designers, the reactor's builders, installation workers, construction engineers and operators all sent their representatives. There was a careful investigation into the causes of the accident. Each of those in attendance tried his utmost to remove the blame from his "firm." At last, the commission came to a conclusion: some had undercalculated, some had not finished their work and others had run the station at loads exceeding standards. These factors, in combination, had led to the accident. Such is the plot of the theatrical film "The Investigating Commission."

We looked at this film and thought: "What do we have to do, so that no station, including our Rostovskaya AES, is ever visited by an investigating commission?"

In the first place, we have to strictly observe all the requirements written in the operating regulations for similar installations. During the construction of a nuclear power station, rush operations cannot be tolerated, neither on the small-scale nor on the large. Only rhythmic work in accordance with the schedule will guarantee the reliability and permanence of the structures.

We, the workers of the design inspection team, recall this common truth because we are alarmed by certain tendencies which have begun cropping up among some construction-site supervisors. Today almost all future AES installation lag behind schedule. At the same time manpower and material resources are frequently diverted from the construction site. When the conversation turned to this fact, the director of the Volgodonenergostroy trust replied: "We throw our forces into the construction site at the critical moment, then we pull them out. We have not been able to cope with such construction projects."

There are other factors besides the director's strange argument that in practice result in unwanted delays. Many construction projects are not the responsibility of permanent work teams. Indeed, the requirements for the execution of any opera-

tion are increased, because all the structures have their particular features and specifics. Therefore, it is very important that the engineers and technicians have a sense of personal responsibility for the execution of the work. How can we speak of responsibility, however, when some engineer cannot manage to make the rounds of one construction site before he is directed to go to another? The same thing happens with the work teams. Some of the teams cannot manage to study and review the blueprints properly before they are taken away.

The site supervisor at the special building, for example, has been replaced six times in two and a half years. Today there is no one who can recall how many superintendants and foremen have been to the site. Three work teams were replaced at the construction site last year alone. Here is a rare case in practice: in 10 months, the general contractor was replaced three times. At first the Atomenergostroy administration carried out this role. Then it was Zavodstroy, and now it is Atomenergostroy again.

Such reshuffling causes mismanagement and a lack of responsibility. Just recently, for example, the crushed-stone bedding was poured for the reactor compartment of the second power unit. The crushed stone was not up to specifications: there was a great amount of soluble contaminants in the stone. Representatives from the design and technical inspection teams had warned A. Usov, the chief engineer from Atomenergostroy, about this. He ordered that the crushed stone be brought in anyway and that the work be continued. It was later necessary to haul 3,000 $m^3$ of crushed stone out of the foundation pit and to spread the stone on roads within the construction site. This cost a great deal of money, and the services of dozens of KamAZ workers were enlisted in this inefficient operation.

The client--the AES board--does not always say its own exacting word, either. Despite prohibiting injunctions from the design inspection team, the underground pipelines were buried with the knowledge of the board and without the preliminary conduction of hydraulic tests. Had we not prevented this, we would have left the potential possibility for the most unexpected accidents. You cannot have such accidents occurring at any construction site, much less at the site of a nuclear power station.

From our point of view, all this happens because there is no comprehensive approach to the introduction of a quality-control system at Atomenergostroy. A technical inspection team has been formally established and is attached to the construction administration. The team, however, is made up of specialists with little experience and all of their work is reduced to recording documents.

In connection with this, we introduce for review by the USSR Ministry of Power and Electrification a proposal to establish a single technical-inspection team at nuclear power station construction sites which, when on site, would not be subordinate to the designers, the client nor to the general contractor.

This is still one other very important item. At the construction site of a nuclear power station, competition is organized along many lines: for the teams' early completion of their contracts, for increased labor productivity, for improved safety techniques, etc. All of this is good. Competition, however, does not stimullate the quality of the work at all. There is no visible propaganda on this subject. We think that this is a serious oversight on the part of both the managing supervisors and the public organizations at the site.

9512
CSO: 1822/113

## EARLY DAYS OF KOSTROMSKAYA AES CONSTRUCTION RECALLED

Moscow IZVESTIYA in Russian 1 Jan 83 p 2

[Article by V. Kozlov: "The Trail Across the Land"]

[Text] He had traveled about for a quarter of a century when he suddenly discovered with amazement that he had never gone anywhere outside the non-chernozem area of Russia. This region, his beloved motherland, had gathered new energy and had spread hundreds of construction sites over its expanse. New settlements followed one after another. The Dzerzhinskaya, Gor'kovskaya, Yaroslavskaya and Ivanovskaya TETs's, the Ryazanskaya and Kostromskaya GRES's and the Kurskaya and Smolenskaya AES's appeared. From small to large, from simple to complex, he moved along the historic stages of development of the Soviet power industry, and now he was approaching the next new construction project.

The bus sped merrily along the road. Aleksey Kiselev, an electrician from administration number three of the Elektrotsentromontazh trust, at times would scrutinize the blue horizon, an unbounded panorama of hilltops, like in Nesterov's paintings. At other times he counted the mushrooms that stuck their heads out along the edge of the pine forest which bordered the road. Finally, the bus stopped.

"We are to come here," said administration chief Vladimir Kas'yanov, pointing to the left. "This is where she will be. The city will be there, over on the right."

Kiselev pensively walked off into the depths of the forest, ran his hand over the gilded trunks of the pine trees and tossed his head back into the blue sky. It was good! He walked out into a clearing that was lightly carpeted with pine needles, lit up a cigarette and said softly:

"Well, hello, new construction site!"

It is now time to say what "she" is. It is the Kostromskaya nuclear power station, which must spring up in this forest and become most powerful in its own way. For the time being, the power engineers' city was also just on paper.

Aleksey Kiselev first of all has to provide the builders with electric power so that there will be warmth and light at all times and so that the machines and mechanisms will operate. The power will arrive here from the Kostromskaya GRES, whose nine mighty power units Kiselev's hands have treated with kindness. After a while,

the bright buildings will rise up amid these pines, and the peaceful atom, charged with the energy of human hearts and hands, will send its power even further, into the country's unified "circulatory" system. In this vivifying power will also be a particle of his, Kiselev's, power.

The settlement of the first of the Kostromskaya AES's builders is a pioneer settlement. On a gloomy day, probably the shortest and the rainiest day--not by the calendar--the settlement looked happy and festive. There were light-blue and gold prefabricated two-story homes and tidy cottages. The streets were sprinkled with a thick layer of golden sand, only the streets were empty. Everyone was at the sites in the forest. The construction site, invisible from here, was alive and working.

Skirting the future reservoir, we set off for its opposite (and future) shore. Here the substation--the first large-scale installation the electricians had put up--had begun operation. It will provide current for the suction dredges which have already

been delivered here to build up a 20-km dam. Later, it will power the reservoir's pumping station.

Aleksey Kiselev pondered over the countless multitude of intricately interwoven wires and leads. The substation was put under load and its batteries run-in. For this the electricians had to work all night. I stood and admired Kiselev's masterly work.

Aleksey is tall, dark-haired and well-proportioned, even in his work overalls. He is an unfussy man of a few words who is not shy for his age. He is the same way at home as he is at work. He is accustomed to doing everything thoroughly, to taking responsibility on himself and to seeing things through to the end. Like a real master, he knows all the complex "mechanics" of his business down to the last wire and condenser. He sees the relationship between each of the parts and assemblies that insure the precise operation of an entire complex mechanism or system. This requires not only experience and skill, but also keen intuition--that creative beginning without which there would be no real master. Kiselev, however, is indeed a master, a jack-of-all-trades. No matter what construction project he would work on, his qualities would manifest themselves everywhere from the first day and would bring him the fame due an ace electrician.

We traveled with Aleksey to those locations he had been shipped to a year and a half ago with the other builders who were first on the site. They began with the clearing where Kiselev had at one time greeted the pines. They had just laid a road of yellow sand to the clearing, and on the day of the Communist Saturday worker, they placed a stone here with the following inscription: "At this location will be erected a monument to the first builders of the Kostromskaya nuclear power station. December 1982." At that time, the piles were being sunk under the first multi-story dwelling not far away.

In a stone at the future construction site they embedded a capsule with an appeal to the inhabitants of the future nuclear city which the builders dreamed of calling (and already called it so among themselves) "Nadezhda" [Hope]. In the appeal, among other things, was written: "Russians, Ukrainians, Kazakhs, Belorussians, Kirghiz--representatives of the many nationalities of the Country of the Soviets

labored selflessly on the construction of the Kostromskaya AES. In this fraternal union lies our solid guarantee of tomorrow's successes as well."

The early December evening was illuminated by lights struck in the northern forest by Aleksey Ivanovich Kiselev and his comrades. Many well-built homes, a store, a dining facility and a beauty of a club with a sports hall were put up here in a short span of time. Roads were laid across the swamps. Warehouses, shops, garages, a crane facility and asphalt and concrete plants were built. Everything that one would call a pioneer production base is already here and is already working to take the first steps at the new construction site--the country's new atomic lamp.

"You start from scratch, and you see how life is conceived before your eyes," said Kiselev. "Is this not remarkable? For the sake of this, it is worth roaming from place to place and showing our country's geography to our children. But, of course, it is nice to work 'from current to current.'"

"What do you mean?"

"This is what it means: you take the power from one station, multiply it by your own labor, the labor of thousands of people, and you get new power. In a word, from the beginning to the very end of the construction project."

It does not always work out this way for Aleksey Kiselev, however. He is frequently taken early off a site that has just been made habitable and he travels to a new site where they send him, that is, to the place where they cannot get by without him. He leaves his family for a long period of time in order to prepare their next new settlement.

Kiselev's family now lives in Volgorechensk. Lyudmila Stepanovna, his wife, works as an equipment operator at the chemical-treatment plant of the Kostromskaya GRES. His daughter, Natasha, is in her second year at the technological institute in Kostroma. His son, Sasha, a young schoolboy, waits for his father to come home at New Year's. Aleksey Ivanovich himself is spending the night in a trailer on the edge of a pine forest outside the ancient village of Popovka: he has a lot of work to do and it is not convenient for him to go to the settlement to spend the night.

In the office of Aleksandr Tryapkin, chief engineer of the AES construction administration, I looked over a model of the future city of Nadezhda. It showed the beautiful city blocks, the age-old pines on the streets, untouched by the first builders on the scene, a huge park, a stadium and the blue of the river Tebza near the city. It is a very beautiful city. I imagine how electrician Aleksey Kiselev stands in a green meadow or in a bright birch grove, or even in the mountains, and, smiling, says:

"Hello, new construction site!"

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## CONSTRUCTION WORK CONTINUES AT SMOLENSKAYA AES

Moscow EKONOMICHESKAYA GAZETA in Russian No 48, Nov 82 p 5

[Article by V. Fedorov: "On the Eve of the Start-up of the Million-kW Power Unit"]

[Text] A critical moment has arrived for the builders, installation workers and operators of the Smolenskaya nuclear power station. Intensive work is being concluded on the construction of the first power unit which has a capacity of one million kW. In all, the design for the AES plans for the construction of four such power units.

More than 220 million rubles worth of work has been carried out since construction of the AES began. About 350,000 $m^3$ of cast-in-situ concrete have been laid and more than 150,000 $m^3$ of prefabricated reinforced concrete and 50,000 t of metal structural elements have been installed.

The equipment and pipeline installed weigh tens of thousands of tons. A small amount of work remains to be done on the million-kW power unit, the first unit to be put into operation. This work, however, demands particular attention. At the present time, the adjustment of the engineering systems and the finishing operations are being concluded on all installations--the reactor and turbine compartments and the auxiliary structures--at the first complex to begin operation. Taking part in these operations are electricians, heat engineers, ventilation specialists and insulation installers. Tests are being carried out on the turbogenerators, and steam obtained from the installed reactor has been used to purge the pipelines.

Since the power unit first began operating, the builders, installation workers and power engineers have concerned themselves with the faultless operation of all the equipment at the AES. For this reason, the acceptance of all the station's unit and assemblies is carried out with particular care. It will not be long before the reactor begins producing power and the power-unit equipment undergoes comprehensive testing.

The entire construction project lives for an important upcoming event. In the course of socialist competition, dozens of work teams display examples of shock work at the first of the installations to begin operation. The builders and installation workers are dedicating the commissioning of the new power giant to the 60th anniversary of the formation of the USSR.

Plans have been made to commission a second million-kW power unit at the Smolenskaya AES in two years, in 1984. Plans have been made to carry out more that 12 million rubles worth of construction and installation work at the new facility in the current year. It will be necessary to accelerate the progress of construction on the second power unit in every way possible, since only 35 percent of the yearly plan has been accomplished in the last 10 months.

Construction of housing and cultural facilities remains to be carried out. Although the planned tasks for the industrial facilities of the first power unit of the Smolenskaya AES have been fulfilled by 120 percent, the indicators for the introduction of housing have been much lower.

The All-Union Soyuzenergozhilstroy Association of the USSR Ministry of Power and Electrification is engaged in housing construction at the Smolenskaya AES. Over the course of several years, the association has not been able to bring the plant for the manufacture of large-scale housing panels up to its rated capacity. This plant is part of the production base for the nuclear power station. As of yet, the organizaers here have not established an administration which would have the power to deal with the tasks that have been set. Therefore, in solving the task of commissioning the pilot power unit, the USSR Ministry of Power and Electrification must provide for a further increase in the pace of construction.

The thousands of builders in the Smolenskaya AES collective have accumulated a great deal of experience over the years. The skilfull utilization of this experience will make it possible to deal successfully with the fulfillment of the tasks for the entire 11th Five-Year Plan.

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NUCLEAR POWER

## YUZHNO-UKRAINSKAYA AES NEARING COMPLETION

Moscow GUDOK in Russian 21 Dec 82 p 4

[Article: "A Nuclear City on the Steppes"]

[Text] The road turned, and before us opened the panorama of the gigantic construction project. The unusual frames of the structures, dressed out in concrete, rose skyward. The openwork towers of the electric-power transmission line set off boldly into the distance, as if rushing to meet one another.

Alongside are the asphalt streets of the young city in which the power engineers live. The Yuzhno-Ukrainskaya nuclear power station is being constructed here, on the steppes near the Black Sea. Symbolically, this is the place where the 3,000-kW Aleksandrovskaya GES, the second after the Volkhovskaya GES, was built during the 1920's. It is still in operation today.

Decades have since gone by, and we have witnessed the development of our domestic nuclear power industry. As usual, we accept the transition from the 5,000-kW station in Oninsk, the first nuclear power plant in the world, to such giants as the Leningradskaya and other nuclear power stations. The Yuzhno-Ukrainskaya AES has its own particular features. Utilizing the natural conditions, its creators built several large-scale reservoirs with a total surface area of 51 $m^2$. They put more than 500,000 $m^3$ of water into these reservoirs. The Konstantinovoye reservoir is the largest of them.

It is well known that thermal and nuclear power stations are one of the principal sources of thermal wastes. Scientists have calculated that it would be necessary to have 1,030,000 hectares of hothouse space to provide the vegetables that the population of our country requires. About 50 billion $m^3$ of natural gas would have to be burned annually to heat them. Nowadays, in order to reach the necessary temperature in hothouses, we utilize water heated to 90°C as the heat-transfer agent. All of these urgent problems can be solved by using heat from nuclear power stations. Academician T. Turbin of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin and Yu. Rezimov, candidate of economic sciences, believe that the shape of tomorrow's unique industrial associations can be seen in the heat-recovery complex. They have proposed the realization of this model at the Yuzhno-Ukrainskaya AES. Such a bioelectrical complex has already been developed. Because of the improved utilization of the secondary heat reserves on hand, a decision was made to build 12 hectares of hothouses here and to expand fishing and irrigation operations.

On the pediment of one of the buildings is a banner that says: "The First Power Unit of the Yuzhno-Ukrainskaya AES Is Our Gift to the 60th Anniversary of the Formation of the USSR."

In November and December--on the eve of the start-up of the first unit--the people worked with a special dedication. The team of fitters led by Yu. Pogorelov achieved high indicators in the installation of the main circulating pumps that insure the uninterrupted operation of the nuclear reactor. The team of finishers headed by I. Balyura fulfilled by more than two-fold their task of painting the reactor housing.

Almost the entire country is building the Yuzhno-Ukrainskaya AES. The generator is being manufactured in Leningrad; the communications equipment was delivered from Tallinn; the turbines arrived from Kharkov; electrical equipment was sent from Georgia; the elevators are from Belorussia; the pumps are from Moldavia; and the compressors are from Armenia.

The scale of this huge construction project is impressive. In a short span of time, the builders have managed to install on the bare steppes more than 100,000 t of various types of equipment delivered here by railroad workers. Approach lines have been built, the construction of the main reactor building has been completed and the reactor itself installed.

The start-up lies ahead. On the eve of this important event I met with Vladimir Pavlovich Fuks--the director of the AES.

"Our station was built in six years," he said. "This is record time. Now the most critical moment has arrived--the charging of the reactor with nuclear fuel. I will mention that one such charging is equal to 5 million t of oil! The AES equipment is most complex, and it is very important that the instrumentation specialists and the physicists know how to run it. When you will be at the station, I recommend that you meet with Leonid Nikolayevich Korchagin--chief of the thermal automation and measurement shop."

Having met with Korchagin, I understood the sort of role he and his people in the reactor control system played in insuring nuclear safety. Indeed, pressures in the reactor reach 160 atm, while temperatures climb to 300°C. Senior foreman N. Suprun, foreman N. Novitskiy, electrical fitter V. Kolomiyets and other experienced specialists insure the reactor's operational reliability. During the hot running-in of the reactor, the commission gave their work high marks.

The shop headed by Korchagin fully monitors the reactor process. There is a computer system in operation, without which the monitoring and control of all operations would be impossible.

A great holiday has arrived on the shores of the Yuzhniy Bug.

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## CEMA WATER-POWER RESOURCES SURVEYED

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 11, 1982 pp 25-28

[Article by Igor' Leskes of the CEMA Secretariat: "Development of the Hydroelectric Power Resources of CEMA Member Nations: Results and Prospects"]

[Text] In 1981 the hydroelectric power stations of CEMA member countries generated about 210 billion kWh of electricity, which is about 12 percent of the total. The capacity of these stations is 66 million kW, or 18 percent of the installed capacity.

GES's carry out diverse functions in the system for supplying electricity to a nation's economy. As part of the fuel and energy complexes of CEMA countries, they reduce the requirement for fuel to produce power, improve the structure of the fuel and power balance (TEB), and increase the reliability and quality of the power supply. And although, as we have seen, the share of power generated at these stations is not great, relatively speaking, their importance for a number of countries that have insignificant reserves of fossil fuels is extremely great.

The European region of the Soviet Union can indicate by example the special importance of hydroelectric power, since these regions are far from fuel sources. The average GES power generation here has been for many years about 30 million tons of standard fuel equivalent per year. In some areas this equivalent easily compares with the amount of fuel brought in. Thus, the electricity generated by GES's of the northwest equals about 90 percent of the Donets and Kuznetsk coal delivered. In the absence of hydroelectric power, it would be necessary to increase accordingly the mining of fuel and to provide for its transport to the TES's.

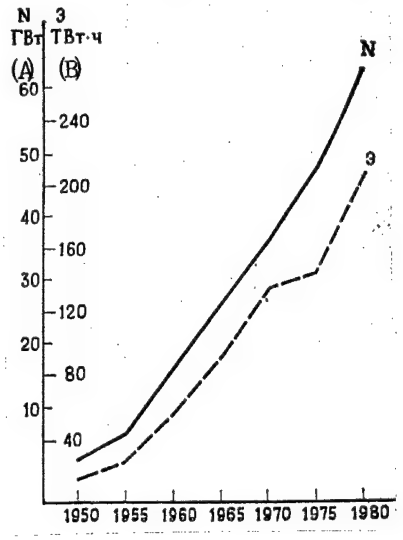
It should be noted especially that the GES's reduce the requirement for gas and mazut fuel, the use of which as raw materials in other branches of the economy yields substantially greater economic benefit.

In participating in covering the variable portion of the load curve, GES's reduce the requirements for special mobile thermal and gas-turbine power plants that operate on scarce fuel.

CEMA member countries have recently been working with common efforts to create pumped-storage electric-power stations (GAES's). Economic, scientific and technical research have shown their reliability. This is occasioned by a number of factors, primarily a rise in the scale of electrical consumption and by an increase in the share of AES's in the fuel and power balance.

The basic tasks of the GAES's are to provide United Electric-Power Systems (OES's) with an emergency reserve capacity and to regulate its frequency and overcurrents by Central Control.

Growth of Installed Capacity and the Generation of Electricity of Hydroelectric Power Stations of CEMA Member Countries




Key:

A. Power, GW.
B. Electricity, TWh.

In speaking about development of the CEMA nations' hydroelectric potential and the prospects for its development, it should be considered that the greatest potential is possessed by the USSR (1,095 TWh), and then the RSR [Socialist Republic of Romania] (40 TWh), the BNR [People's Republic of Bulgaria] and the PRL [Polish People's Republic] (12.1 TWh each), the CSSR [Czechoslovak Socialist Republic] (9.0 TWh), the MNK (Hungarian People's Republic] (5.2 TWh) and the GDR (0.7 TWh).

At the end of 1981 the following had the best indicators for degree of development of hydroelectric resources: the GDR (87 percent), then the CSSR (45.5 percent), the BNR and RSR (30 percent each), the USSR (26 percent), the PRL (24 percent) and the MNK (3 percent).

The share of hydroelectric power in the branch's overall balance is greatest in the RSR (18.3 percent), followed by the USSR (14.1 percent), the BNR (9.8 percent), the CSSR (5.6 percent), the PRL (2.6 percent), the MNK (0.7 percent) and the GDR (0.2 percent). Such a picture is consistent, since it is linked with the availability of the appropriate resources in these countries.

By 1990 the GDR, the RSR, the CSSR and the PRL plan to develop existing resources to the maximum (from 60 to 95 percent) and to convert to the large-scale construction of GAES's.

Let us examine the results and prospects of these countries.

In the People's Republic of Bulgaria, hydroelectric facilities are designed and constructed in accordance with the country's unified water-resources plan, which is governed by the five-year plan for developing the national economy. The main direction is the erection of GES cascades over large rivers. These include the Nikopol-Turnu-Megurele hydroelectric complex on the Danube, the Mesta cascade, and others. By 1990 GES's will comprise roughly 17 percent of the country's total electric-power station capacity, while the power generated will total 7-8 percent.

The main attention is now being paid to the use of small rivers by building a ramified network of collecting diversion works. Thus 450 water intakes with a consumption of several liters of water per second, which is collected in still larger diversion works, were built at the Sestrimo cascade.

Because of the rising requirements for protecting the environment, difficulties in erecting such facilities has increased. Moreover, a trend toward erecting small GES's of 500 kW or higher capacity was noted.

At present a program for introducing about 30 such GES's into operation has been developed. Possible sites for their construction are being refined.

In the Hungarian People's Republic the economically usable hydraulic resources are assessed at 4.6 TWh. Of that amount, 75 percent is on the Danube, 10.5 percent on the Drava River and 8 percent on the Tise River. Construction is to continue until 1990 on the Gabchikovo-Nad'marosh system of hydraulic-engineering units, and, in the longer term, until the year 2000, on a number of other GES's on the Danube and Tise Rivers. MicroGES's with capacities of several hundred watts to 2-3 MW are also of great importance for the country.

In the German Democratic Republic, GAES capacity has increased rapidly. After the Markersbach GAES went into operation, preparatory work began on the Gold'istal GAES. The introduction of new facilities into operation has not been called for at present by virtue of the exhaustion of economically justifiable conditions for it. The main attention today is being paid to rebuilding GES's.

Small GES's with a total capacity on the order of 30 MW play an important role in the GDR. The potential of streams for erecting them is being studied.

In the Republic of Cuba, it is planned in the long term to build GAES's with a total capacity on the order of 500 MW. By the year 2000 it is proposed to bring this to 1,500 MW. The microhydroelectric-power potential is assessed at 550 MW.

In the Polish People's Republic, the reserves of hydroelectric resources have been concentrated basically in the Vistula, Odra and Nema River basins. Meanwhile, some unfavorable topographic, geological and other conditions hamper their full use.

Recently the country studied the "Visla" project. It is integrated in nature and includes questions of hydraulic power, water supply, agriculture, ship navigation, the purification of effluent, and so on.

As is known, the Vistula basin occupies about 60 percent of the PRL's land area. Eighty percent of its hydraulic engineering potential is concentrated here. According to the design, work is planned for three areas. To be built are GES cascades--with a total capacity on the order of 1.4 million KW, with generation of about 3 billion kWh of electricity, on the Lower Vistula, of 500-600 MW and about 1.7 billion kWh, respectively, on the Middle Vistula, and of 200 MW and 0.5 billion kWh, respectively, on the Upper Vistula. It is planned to create this GES complex, which is significant in scale, as a more "flexible" element of the country's whole power system, which will provide for the fulfillment of the majority of the system's functions.

It is proposed to automate all three cascades to the maximum so they can be controlled from the central points of the large GES's of each cascade. In their turn, they should have ties with the control center of the whole power system, and also with control centers for ship navigation and water supply.

The PRL's total hydroelectric potential is at present 12.5 billion kWh. The "Visla" design contemplates the use of about 50 percent of this potential. The remaining portion will be extremely dispersed, and the erection of about 800 small capacity GES's would be required to use it.

Great attention is being devoted in the PRL also to the construction of GAES's. In 1980 the Porombka-Zhar GAES, of 500 MW capacity, entered operation. Today work is proceeding on a GAES of 680 MW capacity at Zharnovets and one of 750 MW capacity at Mloty. The share of GES's and GAES's in the PRL power system rose from 4.1 percent in 1975 to 6.2 percent in 1980.

In order to provide an adequate amount of electricity for the Socialist Republic of Romania the 12th RKP [Romanian Communist Party] Congress developed and confirmed a Prescribed Program of Research and Development in the Energy Field for the Period 1981-1990 and the Main Directions Prior to the Year 2000. It notes that during the forthcoming decade, it will be necessary to solve this important problem through internal resources, including intense development of the country's hydroelectric potential, from 30 percent in 1980 to 45 percent in 1985 and to 65 percent in 1990.

It is planned to make full use of the hydroelectric resources that Romania has at its disposal by the year 2000. For this purpose, a number of GES's will be built by 1990 at Danube border areas, jointly with the neighboring states. Construction thereof is planned for the Romanian portion of the river. As a result, electrical generation per GES will rise from 17.4 in 1982 to 21.2 percent in 1985 and to 24 percent in 1990.

The RSR plans also a broad program of creating more than 1,500 microGES's and GAES's. The republic's machinebuilders have now mastered the series output of three models of microhydraulic units in 11 standard sizes and have arranged for the production of equipment for microGES's of original design that are intended for mountain areas difficult of access.

Plans for developing the USSR's national economy call for improvement of the fuel and power balance, including that based upon the wide use of hydraulic resources. This refers to the erection of large hydraulic engineering complexes that will permit the tasks of generating electricity, irrigating land, providing water for cities and industrial enterprises, developing ship navigation and the fishing industry, and preventing flooding to be solved in integrated fashion.

High-capacity GES's are being built mainly in the country's east. Seventy percent of the All-Union increase in capacity at these electric-power stations will be obtained in Siberian regions. Rivers here can provide for the annual generation of 422 TWh of electricity (38.5 percent of the All-Union power-engineering potential), rivers of the Far East 229 TWh (27.4 percent), and rivers of Central Asia and Kazakhstan 173 TWh (15.7 percent).

Such hydroelectric-power giants as the Sayano-Shushenskaya GES on the Yenisey, with a capacity of 6,400 MW, the Boguchanskaya on the Angara with 3,000 MW, and the Rogunskaya GES in Tajikistan with 3,600 MW, are being built in these areas.

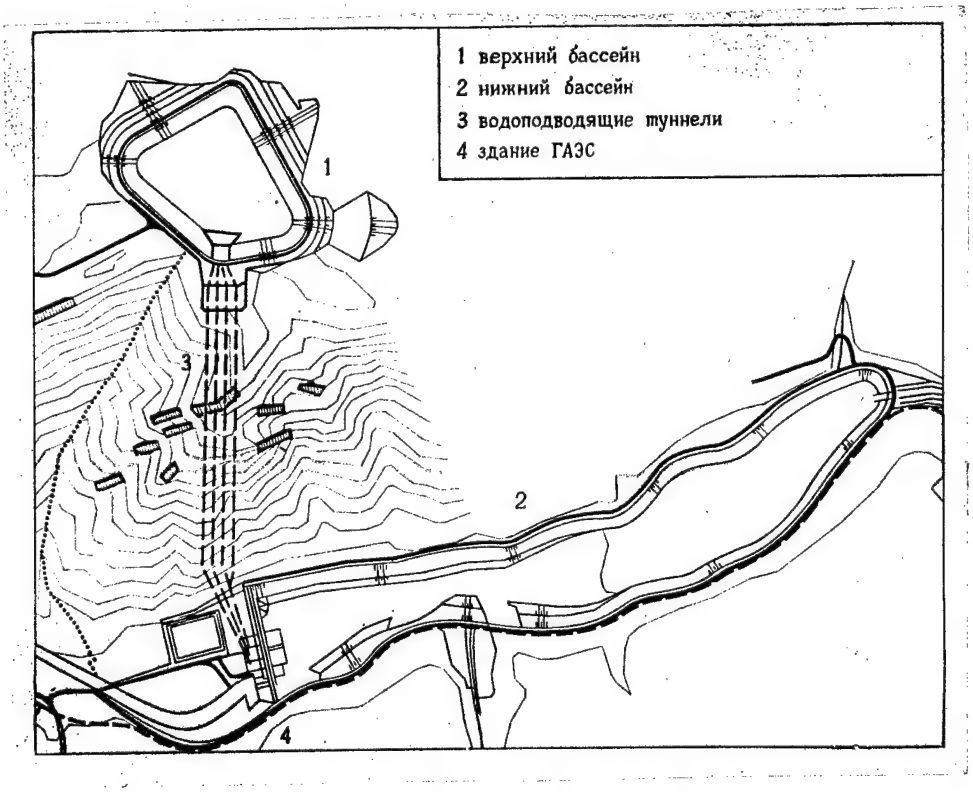
In the European portion of the USSR the main part of the unused hydroelectric potential is concentrated on small and medium-size rivers. Their development involves great difficulties, caused by much flooding of agricultural land, the inflicting of damage on the fishing industry, and the relocation of inhabitants. Development of the Volga-Kama cascade will be completed during this five-year plan, thanks to the introduction of the Cheboksarskaya and Nizhnekamskaya GES's at full capacity. Construction of the Dnestrovskaya GES will be completed. In the North Caucasus, work will continue on the Zaramagskaya, Miatlinskaya and Zelenchukskaya GES's.

The GES's are now generating about 14 percent of all the country's electricity, and their installed capacity is 19 percent of total power-plant capacity. By 1985 electrical generation at GES's throughout the country as a whole is planned to be brought up to 230-235 TWh.

By 1990 it is proposed to turn over for operation the Daugavpilskaya GES in Latvia and the Irganayskaya GES in the North Caucasus.

GAES's are being built in the European part of the USSR in order to cover the peak portion of the load. At present the Kiev GAES is operating with a head of 66 meters and a capacity of 225 MW, and the Zagorskaya GAES, which is under construction, will have a head of 100 meters and a capacity of 1,600 MW. Six GAES's with a total capacity of about 12 GW are in the design stage.

In order to support dynamic national economic development in the Czechoslovak Socialist Republic, use of the hydroelectric power potential is to be expanded and the construction of GAES's is to continue. In addition to the Daleshitsa and Cherny Vag GAES's, preparations have been made for the construction of a GAES at Dlouga Strane and of the hydraulic-engineering complex of Gabchikovo on the Danube.




Scheme for the Location of Structures of the Cherny Vag Pumped-Storage Electric Power Station in the Czechoslovak Socialist Republic.

Key:

1. Upper basin.
2. Lower basin.
3. Water-delivery tunnels.
4. GAES building.

The prerequisites also exist for the erection of other pumped-storage electric-power stations, on which design developments are being executed, including stations in regions of the mountain massifs of Krkonoshe and Beskidy, and also in Southern Slovakia.

In accordance with the Master Water Resources Plan for Czechoslovakia, the technical and practical potential for the use of streams has been assessed at 9.03 TWh per year. At present about 38 percent of the primary potential is being introduced into the economic turnover. It is expected that this will be raised to 56 percent by 1990.

One of the most important reserves is use of the potential of small streams. Their significance grows as the shortage of fossil fuels increases. As a result, the CSSR Government has adopted a decree about the possible use of small GES's and the rebuilding and construction of small-capacity GES's. Because of them, it will be possible to obtain about 1,680 GWh per year of additional capacity.

Today there are 230 small GES's with a total capacity of about 160 MW in operation that generate about 530 GWh of electricity. About 700 small GES's with a total capacity on the order of 215 MW and with a hypothetical generation of about 850 GWh of electricity can be renovated or built.

The United National Conference on New and Renewable Sources of Energy that was held in Nairobi (Kenya) in August 1981 adopted a program of actions, within the framework of which agreement was reached:

about evaluation of the hydraulic potential of rivers and the use of existing and the development of new methodologies for determining the amount of water flow in places where there are no water-measuring posts;

about determining the criteria for evaluating both the economic development of small, low-lying and large-scale hydrological resources in the context of general power-engineering development and multiple-purpose programs;

about study of the use of the water reservoirs of hydraulic-engineering complexes for obtaining electric power and for other purposes; and

about speeding up the introduction into operation of small-scale hydroelectric systems (including micro-scale systems).

The tasks posed are being realized in the process of the multilateral economic, scientific and technical ties of the CEMA member countries, within the framework of the CEMA Standing Commission on Collaboration in the Field of Electric Power and Its Operating Organ--Section 3, on Hydroelectric Power Stations. In the collective work that was carried out in 1980, the sizes that are economically justified for use of hydroelectric-power resources were refined and measures for the long term were planned. At present, research connected with the rational use of hydroelectric resources within the framework of integrated water-resources systems of the CEMA member countries is being prepared. Preparations for other joint work are called for. They have the aim of introducing the microhydroelectric potential of the CEMA member nations into the economic turnover and of determining the economic effectiveness of creating small GES's.

In accordance with the Integrated Program and the DTsPS [Long-Term Specific-Purpose Collaboration Program] on energy and raw materials of the CEMA member nations, maximum use is to be made of our own resources, including hydroelectric. The Master Scheme for Long-Range Development of the United Electric-Power System of CEMA Member Countries up to 1990 is being refined.

In the area of hydroelectric power, engineering tasks have been set for the shaping of an optimal structure for generating capacity in national power-engineering systems and the erection of power-engineering facilities, including GAES's, by the joint efforts of the interested countries.

Based upon the decisions of the 35th CEMA Sessions (the 35th conference), the CEMA Standing Commission on Collaboration in the Field of Electric Power is developing a concept of long-range development of the OES's [United Electric-Power Systems] of CEMA member nations during the period up to the year 2000. It will call for a set of measures, including possible interactions with the united power systems of Western Europe.

Because of the necessity for more effective and rational use of hydroelectric resources, CEMA member nations face the tasks of improving the operation of existing GES's and the modernization of obsolete ones, and the rebuilding of hydraulic engineering structures with a view to raising their capacity and increasing the generation of electricity. Much remains to be done also to raise the technical level, particularly in the automation of GES and GAES operations. These questions were examined at the last seminar, which was held in June 1982 in Burgas (Bulgarian People's Republic), in whose work specialists of the BNR, MNK, GDR, PRL, RSR, USSR, CSSR and SFRYu[Socialist Republic of Yugoslavia] took part.

In conclusion, it should be noted that the work conducted within the framework of the Commission and its working organ--Section 3--on evaluating the modern status and the prospects for further developing hydroelectric power resources is of great importance for developing the branch as a whole and for further strengthening the electric-power base of the fraternal countries.



11409
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PIPELINE CONSTRUCTION

## OCTOBER PROGRESS ON GAS-EXPORT PIPELINE CONSTRUCTION REPORTED

Moscow EKONOMICHESKAYA GAZETA in Russian No 45, Nov 82 p 4

[Article by V. Voznyak: "October on the Route"]

[Text] The first month of the last quarter of the year is usually one of the most difficult for construction workers, especially those who are working on the erection of trunk pipelines. In October frequent rains and snow and the lack of roads make the delivery of pipe and other freight difficult on many portions of the Urengoy-Pomary-Uzhgorod gas pipeline, and they inhibit the performance of welding, insulating, earthmoving and other types of work. But even this did not prevent a further buildup in the pace of gas-pipeline erection.

New subunits of Glavvostoktruboprovodstroy [Main Administration for Pipeline Construction in the Eastern Economic Region], Glavyuzhtruboprovodstroy [Main Administration for Pipeline Construction in the Southern Economic Region], Glavukrneftegazstroy [Main Administration for the Construction of Oil and Gas Enterprises in the Ukraine] and Soyuzintergazstroy [All-Union Association for the Construction of International Gas Pipelines] have promoted work on the line. While 18 integrated flow-line operating groups were working on construction of the pipeline at the start of October, by the end of the month there were 31. This enabled October's goal for erecting the linear portion of the gas pipeline to be greatly overfulfilled.

On 25 October the first thousand kilometers since start of erection of the gas pipeline had been insulated. As of 1 November 1982 about 3,500 kilometers of pipe had been sent to the route, 2,600 kilometers had been welded into pipelengths, and 1,400 kilometers had been welded into the line.

Glavsibtruboprovodstroy [Main Administration for Pipeline Construction in Siberia] subunits have undertaken construction of the gas pipeline in the northernmost of its sections in Tyumenskaya Oblast. Even before the freezes struck, the Siberian builders had done much preparatory work: they had laid log roads in the muddiest places, made crossings over small rivers, creeks and gullies, and constantly "beat out" haul roads with bulldozers for the most rapid freezing of the ground and the possibility of constructing winter roads. All this enabled the flow-line operations groups to insulate about 30 kilometers of gas pipeline during the month of October.

A large amount of work was done in October to build underwater pipeline crossings across rivers. The most complicated and important tasks were the laying of an inverted siphon (underwater pipeline) 2,516 meters long across the Volga. This

work was done by the Kazan Administration of Soyuzpodvodtruboprovodstroy [All-Union Association for Underwater Pipeline Construction] with high quality and greatly ahead of the established construction deadline. In October the second (reserve) strand for an underwater crossing of the Kama, 620 meters long, was laid, and half-kilometer crossings of the Vyatka and Sosna rivers (in the area of the town of Yelets) were put down.

Subunits of Mingazprom [Ministry of Gas Industry] and the contracting ministries built during the month a large amount of warehouses and areas for equipment that will start to arrive at the project. West European and Japanese firms are continuing to send gas-pumping units and other equipment, despite the USA's administrative sanctions.

Socialist competition has been widely promoted at the construction project under the Workers' Relay principle, and each day the ranks of the advanced workers and production innovators are multiplied. Glavtruboprovodstroy its chief is I. Mazur) subunits are maintaining primacy in the competition. The flow-line operating groups of Glavyuzhtruboprovodstroy (the chief is N. Zhukov) and of Glavukrneftegazstroy (the chief is S. Kindrat) have begun to operate better. The collectives of the integrated flow-line operating groups in which the brigade-contract method was introduced, with the pay for all workers, engineers, technicians and white-collar workers hired by these units made under a single job authorization, have achieved great successes.

The best results were achieved in October by the collectives of the integrated flow-line operating groups supervised by A. Buyankin (Mosgazprovodstroy [Moscow Gas Pipeline Construction Trust]), L. Mikhel'son (Kuybyshevtruboprovodstroy [Kuybyshev Pipeline Construction Trust]), V. Belyayev (the Welding and Assembly Trust), A. Pin'yevskiy (Soyuzgazspetsstroy [All-Union Trust for the Construction of Special Gas-Industry Facilities]), V. Radchenko (Ukrtruboprovodstroy [Ukrainian Pipeline Construction Trust]) and V. Maslakov (Novosibirsktruboprovodstroy [Novosibirsk Pipeline Construction Trust]).

At the same time, there are a number of unsolved questions about the gas pipeline construction. Mingazprom has not provided fully for issuance of the design and budget-estimating documentation for the compressor stations, which will be put into operation in 1983, to the contracting ministries. The design of housing and cultural and domestic-amenity facilities for gas-pipeline operating personnel is lagging. Preparation for work under winter conditions has not been completed at all the construction sites.

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PIPELINE CONSTRUCTION

## NOVEMBER PROGRESS ON GAS-EXPORT PIPELINE CONSTRUCTION REPORTED

Moscow EKONOMICHESKAYA GAZETA in Russian No 50, Dec 82 p 3

[Article by A. Panin: "In November on the Route"]

[Text] The goal for construction of the Urengoy-Uzhgorod trunk gas pipeline specified for November was greatly overfulfilled. The average daily pace of erection on the line exceeded 18 kilometers. Altogether more than 1,600 kilometers of gas pipeline have now been welded into the strand.

In November the collective of the flow-line operating group under A. Buyankin, from Mosgazprovodstroy [Moscow Gas Pipeline Construction Trust], set a monthly record for production--32 kilometers.

The gas pipeline builders continued to labor in shock-work fashion during the difficult conditions of fall flooding in the European part of the country. The 10-day goals were overfulfilled by flow-line operating groups in the Udmurtskaya, Tatarskaya, Chuvashskaya and Mordovskaya ASSR's and Gorkovskaya, Tambovskaya, Ryazanskaya, Lipetskaya, Orlovskaya, Kurskaya, Kiev, Vinnitskaya, Ivano-Frankovskaya and Zakarpatskaya Oblasts. New operating subunits came to the route in Tyumenskaya, Sverdlovskaya and Permskaya Oblasts.

A coordinating council has been formed under the AUCCTU for further promotion of the competition of interdependent workers under the Workers' Relay principle and for execution of checks on fulfillment of the agreements concluded about introducing gas-pipeline facilities into operation ahead of schedule and about manufacturing and delivering operating equipment. Competition staffs have been organized on the route in the construction areas into which the gas pipeline route has been divided (EKONOMICHESKAYA GAZETA, No 42).

Thousands of Komsomol envoys continue to arrive on Komsomol work tickets. Staffs that sponsor facilities of this All-Union shock-work construction project are working with the Komsomol Committee of the Ukraine and Komsomol committees of the oblasts through whose land the trunk line will pass.

The construction of first-priority compressor stations is being speeded up. Collectives of the Sumy Machinebuilding Production Association imeni Frunze, the Volgograd Petroleum Machinebuilding Production Association, the Tallinn Plant imeni I. Lauristin, the Borisoglebskiy Chemical Machinebuilding Plant, and the Lysva Turbogenerator Plant are manufacturing the equipment, outfitting components and parts for the gas pipeline compressor stations ahead of schedule.

The promotion of competition, a rise in the power-to-worker ratio, improvement of the technology and organization of production work--all these help labor productivity to grow during construction of the gas pipeline. Output per flow-line operating group for the first 9 months of this year averaged almost 70 kilometers for Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry enterprises] versus 60 kilometers per flow-line group for all of 1981. The task has been posed of bringing annual output per integrated flow-line operating group up to an average of 100 kilometers of finished pipeline for the ministry. Competition among the line's builders are aimed at this right now. The industry's workers are struggling to carry out ahead of time the 1982 plan and the socialist commitments that were adopted in celebration of the 60th anniversary of the forming of the USSR.

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PIPELINE CONSTRUCTION

## WORKING CONDITIONS ON GAS-EXPORT PIPELINE DESCRIBED

Moscow SOVETSKAYA ROSSIYA in Russian 20 Nov 82 p 1

[Article by R. Yevseyeva: "The Confident Step of the Trunk Line" and news items]

[Text] More than 1½ thousand kilometers have been welded into the pipe "strand"! The builders of the Urengoy-Pomary-Uzhgorod gas-export pipeline have been mastering that goal these days. A third of the long path has been trod. The ditch that is being excavated for laying the steel channel has been extended by 1,300 kilometers. Almost 1,150 kilometers of pipe have been insulated and stacked at the "workplace." Such steady, sound indicators testify to the teamwork of all Minnefte-gazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] subunits.

The workers on the line are toiling today under difficult conditions. It is the wet season from the foothills of the Urals to the Carpathian mountains. Throughout the whole European part of the intercontinental trunk line there are rain, fog and mire. There are no hard frosts, even beyond the Urals. It is difficult for the drivers: during the wet season it is difficult to overcome the soaked roads when delivering pipe to where it will be welded. But nevertheless, the daily pace of the trunk line is maintained at record limits--16 to 17 kilometers. Thirty-seven overhead-welding flowline groups and 32 insulating-operations flow-line groups have been extending the route precisely on time. Advanced collectives, taking advantage of good weather, have exceeded the established norms. The collective of the flow-line group supervised by V. Radchenko of Ukrtruboprovodstroy [Ukrainian Pipeline Construction Trust], for example, has achieved excellent indicators: it welded 9.4 kilometers of pipe in 6 working days. This result greatly exceeds the standard level.

The integrated flow-line operating groups that have been established on the route have confirmed their effectiveness under difficult weather. The basis of their work is the brigade-contract method. The labor of the workers, engineers, technicians and white-collar workers is paid nowadays according to a single job order, which is computed according to the cost of the finished construction of a kilometer of pipeline. The new work organization will help in successfully fulfilling strenuous plans and increased commitments. First places in socialist competition traditionally are held by the integrated flow-line operations group of V. Belyayev, from the Welding and Assembling Trust, and L. Mikhel'son, from Kuybyshevtruboprovodstroy [Kuybyshev Pipeline Construction Trust]. On the communist free Saturday workday--18 December--the Kuybyshevers will be getting ready to weld the "red joint" on their 127th kilometer section of the route. V. Belyayev's flow-line group collective also

is completing its work in Gorkovskaya Oblast. Some of the machinery and mechanisms that have been released here will be sent beyond the Urals, where they will be used at a new section in the area of the Pelym River.

Subunits of Severtruboprovodstroy [Siberian Pipeline Construction Trust] and Priobtruboprovodstroy [Ob Pipeline Construction Trust] have laid about 50 kilometers of pipeline on the terminal section of the route. With the onset of freezing, the construction pace will increase. By this time, collectives that have completed their work on the Urengoy-Novopskov trunk line will be transferred here.

During these days Soyuzpodvodtruboprovodstroy [All-Union Association for Underwater Pipeline Construction] laid an inverted siphon across the Chusovaya River under the most difficult conditions. The stream is not so wide--158 meters altogether--but the site of the crossing has proved to be in the "grip" of a rocky armor. In order to deploy the equipment, small platforms had to be won with blasting. In laying a channel for the gas pipeline, the builders of the crossing removed more than 1,000 cubic meters of rock of hardness category 9--out of 10. Next for the underwater workers is the mighty Dnepr, at whose shores preparations have already been finished for running an inverted siphon. Waiting for them also is the Siberian Ob, where more than 2½ kilometers of an even watery surface are to be conquered.

The collectives of the export gas pipeline builders are working today with great enthusiasm. Thousands of the country's enterprises and organizations are extending them great assistance. The Workers' Relay, which had its origins in the brigades, has now come up to the branch-of-the-economy level. An agreement about mutual socialist commitments among all participants in erection of the Urengoy-Central Economic Region and Urengoy-Pomary-Uzhgorod trunk gas pipelines has been concluded. It is difficult to compare the scale of the competition that has been promoted with anything else. In striving to put the gas pipeline's capacity into operation ahead of schedule, more than 2,400 collectives have been included in the Workers' Relay. A special council that coordinates the activity of all the collectives that have signed the agreement has been created.

The work is boiling today, from Urengoy to Uzhgorod. With each new kilometer the day comes ever closer when Siberian gas will pass through the transcontinental trunk line.

News Items

The first 100 kilometers of large-diameter pipe have been welded on the Kursk section of the Urengoy-Uzhgorod gas pipeline. Almost half of the joints that unite the pipelengths into a continuous strand were made by Styk welding complexes. The new equipment was assimilated most quickly by the brigade of V. Leont'yev of Krasnodartruboprovodstroy [Krasnodar Pipeline Construction Trust]. Use of the complex has doubled the speed of the work.

At Ufa a specialized center of the Cheboksary Industrial-Tractor Plant has been established. Its workers have undertaken all the responsibility for guaranteed technical servicing and supplying of spare parts for the TG-502 pipelayers that belong to Glavvostoktruboprovodstroy [Main Administration for Pipeline Construction in the Eastern Economic Region].

The collective of Kazan's Tasma Production Association has sent more than 110,000 meters of industrial X-ray film to the builders of the Urengoy-Uzhgorod gas-export pipeline, for checking the quality of the welded joints. The technology for manufacturing it was developed by staff workers of Kazan's scientific-research institute, Tekhfotoproyekt. The new product will arrive at the route in 150-meter rolls, a fact that will greatly speed up X-ray monitoring of the welded joints.

The first lot--7,000 sets of workers' clothing--has been sent to the Urengoy-Uzhgorod gas pipeline builders by the Makeyevka Garment Production Association, Spetsodezhda. The enterprise's workers have undertaken to assimilate the manufacture of the new special coveralls in the northern version this year. The garments for electrical welders are sewn from special light-weight fabric that does not transmit cold and is not damaged by flame.

The Makeyevka garment workers have committed themselves to manufacturing at least 13,000 pieces of the new-model coveralls for electric welders of the northern section of the gas pipeline by the end of the year.

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PIPELINE CONSTRUCTION

## TULSKAYA OBLAST GAS-EXPORT PIPELINE LINK FINISHED YEAR IN ADVANCE

Moscow SOVETSKAYA ROSSIYA in Russian 22 Dec 82 p 4

[Article by V. Anikeyev (Tulskaya Oblast): "The Tulskaya Oblast Speedup"]

[Text] Shchekingazstroy [Shchekino Trust for the Construction of Gas-Industry Facilities] has won a remarkable victory: it has completed laying of the linear portion of the Tulskaya Oblast section of the Urengoy-Pomary-Uzhgorod gas pipeline a year ahead of schedule. Fifty-three kilometers of trunk gas pipeline were welded, covered with insulation, laid in the ditch and backfilled. The concluding operations are going on full blast: erection of the operating components and the system for mating with the inverted siphon across the Don, which underwater workers will lay, and with the compressor station.

A year ahead of schedule. How could the Shchekinoites have coped with the task so rapidly? The good work took shape from many factors. The gas pipeline's party and social organizations and the administration creatively promoted everything that had been found previously at shockwork construction projects. Among the basic factors of the coordinated actions was the creation of the single integrated flow-line operations group. This system enabled all the brigades to be joined into a unified collective that was strong and lived for a single purpose.

Trust chief engineer V. Genin says:

"We tried to work in such a way that a broad work front was opened up for the brigades that are following the trail. For example, the rotary-welding brigades of V. Proskurin and I. Svirid carried out almost two norms, creating a reserve of pipe-lengths to be sent out to the line. In their turn, drivers of S. Silakov's brigade from A. Krivenchuk's truck unit hauled up to 2 kilometers of 'extra' pipe each day, which has never been surpassed on the route. Experts of the specialized earthmoving operations administration also worked with a precise rhythm. The flow-line group principle let human and material resources be concentrated in one place, and mutual assistance became the norm. Those who trod the path ahead of time turned back to help their comrades overcome gullies, complete welding on pipe joints and maintain the adopted pace.

Purposeful large-scale political work also helped to create a combat mood on the route. A special propaganda group operated directly on the route and was able to maintain the spirit of the advanced workers. "Of course the ideological commission," emphasized trust party committee secretary M. Ageyev, "was involved not just in

propaganda, but it also was persistently concerned about the necessary conditions for recreation, daily amenities and the labor of the route's builders."

What has the year won given to the pipeline? Trust manager O. Sagitov comments on the Tulskaya Oblast line workers' achievement:

"Introducing this segment ahead of time enabled the central 220-kilometer segment of the pipeline to start operation. It combines the set of North Caucasus-Central Economic Region gas pipeline and the strands that run from Urengoy to the European part of the country into one system. The combining of these two gigantic systems will enable power engineers of Tulskaya, Moscow, Lipetskaya, Kurskaya and other oblasts to be given many additional millions of cubic meters of gas in the coming year."

The year saved enabled the trust itself to start building the second strand of the Urengoy gas-pipeline system, which will run parallel with the export trunk line, ahead of the schedule. And still another winning: the time saved will enable the Shchekinoites to build one more such link of the route in Poltavskaya Oblast. Tulskaya Oblast construction workers, having dedicated their labor victory to the 60th anniversary of the USSR, are getting ready to fulfill a new assignment.

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PIPELINE CONSTRUCTION

## EARLY STARTUP OF TRANSKAZAKHSTAN OIL PIPELINE THREATENED BY LAG AT TERMINAL

Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 18 Nov 82 p 1

[Article by V. Stupak (Pavlodarskaya Oblast): "A Petroleum River Flows South"]

[Text] The Pavlodar-Chimkent oil pipeline is one of the most important facilities due for startup during 1982. Intersecting the whole republic from north to south, the 1,642-kilometer long steel meridian will connect Siberia's fields of "black gold" with the oil refineries of the country's south by the shortest path. This raw material is intended not only for the installation that is being built in Chimkent but also for the existing refinery at Fergana. Supplying this enterprise with crude from Pavlodar by rail has been unsteady, costly and unreliable. Because of the constant shortage of tank cars, less than half of the number of trainloads planned for Fergana are dispatched daily.

The new arterial will be shorter than the rail route by almost 2,000 kilometers for the crude, it will reduce rolling-stock requirements by many hundreds of units, and it will relieve considerably the load on the Tselinnaya Railroad, especially its Pavlodar branch, which is the most heavily loaded in the republic.

The urgency of the task is evident from this. In order to solve it, the Kazakhstan Communist Party Central Committee and the republic's council of ministers managed to boost construction of the oil pipeline and its introduction into operation this year. Three Union ministries that are answerable for the timely introduction of oil pipelines--Minnefteprom [Ministry of Petroleum Industry], Minspetsgazstroy [Ministry of Construction of Special Gas Industry Installations] and Minenergo [Ministry of Power and Electrification]--were compelled to take energetic measures to accelerate construction. The forces of more than a score of subunits from Siberia, Central Asia and the Volga region were thrown onto the Transkazakhstan route. A major portion of the work was done in a short time. But not everything has been brought up to the ready-for-startup level yet.

Today KAZAKHSTANSKAYA PRAVDA tells about work progress on each of the three segments that make up the oil pipeline. A word to our correspondents who visit the route.

The Pavlodar segment, from the city to the Karagandinskaya Oblast border, serves as a terminal segment, and therefore it also determines the feasibility of the contemplated deadlines.

"In order to push Siberian crude through to Chimkent," says chief of the Pavlodar Regional Oil Pipeline Administration D. Bespalov, "we should, aside from work on the pipeline itself, start up the terminal pump station in Pavlodar and the booster pumping stations at Trudov village, near Karaganda, and at Chula-Kurgan, near Chimkent. These stations will, for the first time, support operation of the Chimkent refinery and the loading of trains for Fergana. In the future another 13 stations will rise up on the route, to raise throughput of the trunk line severalfold and to supply raw material to all the southern refineries planned for the long term."

Despite the long-established date for starting construction of the oil arterial, work was promoted in earnest here only in June of this year. Saratov's Privolzhskgazpromstroy [Trust for the Construction of Gas-Industry Enterprises in the Volga Region] was charged with welding the strand and laying it in the ditch, from kilometer 0 to kilometer 147. Association deputy chief G. Paladzh says:

"We accept the whole responsibility that is vested in us. For we route workers have decided to consider that those who toil on the terminal segment will set the pace for all the collectives that are working to lay the trunk pipeline. Therefore, we have sent there two mobile collectives--SMU's [construction and installing administrations] Nos 35 and 36."

In order to be able to lay the strands before the freezes and to test them with water, the Saratovians have been working on the route throughout all daylight hours since the middle of summer. And although the originally promised deadline--the start of September--was not met, today this segment to Ekibastuz is almost ready, except for the crossing of the Irtysh-Karaganda canal. And up to kilometer 102 the Saratovians have managed to pressure-test the finished section with water, and today or tomorrow they will begin to supplant it with crude oil, which will be fed directly from the Omsk-Pavlodar oil pipeline.

Also, laying of the line from Ekibastuz to Karaganda, by Bukharapromstroy [Bukhara Industrial Construction Trust, is also close to completion: a substantial part of the network has already been tested. Only a few sag bends remain unconnected. So it is that the pipeline will be ready soon. But now the terminal pump station, without which it is impossible to feed oil to Chimkent, causes anxiety.

The trouble is that this facility, which is complicated in execution, was entrusted 8 years ago to Ekibastuz's power-engineering construction workers, who have plenty of work as it is. Like other participants in the oil-pipeline construction project, they abandoned the station a long time ago. But, while the other collectives have now managed to mobilize forces and concentrate people on the route, which is due for early startup, Ekibastuzenergostroy [Ekibastuz Trust for the Construction of Power-Engineering Facilities] and, in particular, its general-contracting administration, Pavlodarenergostroy [Pavlodar Power-Engineering Construction Administration], still have not been able to fill the breach.

The vast site of the complex has now been developed with ditches and foundation pits. Two buildings tower like white islands amid this earthmoving work: the main and booster pump stations. Windows have been installed, the finishing work is done,

and the buildings have been whitewashed, but inside it is cold, empty and almost free of people. The pumps, it is true, are in place, but without pipe connections and fixtures. There are no electric motors, panels, conduits and signaling and similar equipment, and there are no systems for circulation or space heating or ventilators or systems thereof. But the main thing is that you rarely see an installer anywhere. Even at the farm of giant tanks, which must be connected with pipes and fixtures in a hurry if they are to be tested with water before the freezes come. Even in that vicinity, we counted fewer than 10 workers from Sredazenergomontazh [Central Asian Trust for the Installation of Power-Engineering Equipment].

"In 10 months little more than 600,000 rubles' worth of construction and installing work has been done, out of 1½ million rubles' worth," says D. Bespalov. "Today there are about 110 people at the project, but there are only 40 of those who are most necessary--installers of electrical and heating equipment."

D. Kaloshin, chief of the general-contracting construction administration, Pavlodarenergostroy, does not at all deny the state of affairs at the construction project.

"There are no heating-equipment or electrical-equipment installers--that is the main trouble," he says. "At the start, Energostroymontazh [Administration for Construction and Installing Work at Power-Engineering Installations] should have been doing the work, but it did not send people, and then the decision was made to transfer the job to the Pavlodar administration, Sredazenergomontazh. But they did not have enough people. To be able to cope with the work volume even by the end of the year, they would have to double manpower at the job. However, there is nowhere to expect reinforcements from in the near future, since the heating-equipment installers are busy preparing TETs-1 and TETs-3 for the winter. Therefore, we have been compelled to telegraph USSR Minenergo with an appeal for assistance.

The situation is aggravated by the fact that if at least two tanks are not connected up and tested before winter begins, the startup of the terminal pump stations will have to be postponed until spring, since the strong freezes that are usual at this time of year will not allow testing.

The general contractor and the client must in no way permit such an interruption. The economic losses from delaying startup of the oil pipeline are too great.

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PIPELINE CONSTRUCTION

## PIPELINE CROSSING OF CHUSOVAYA RIVER DESCRIBED

Moscow IZVESTIYA in Russian 11 Dec 82 p 1

[Article by T. Trofimova, correspondent of the Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] Press Center (on the Urengoy-Pomary-Uzhgorod Gas Pipeline route): "Even Though the Chusovaya Is Not Wide...."]

[Text] A gray dank fog hangs over the Chusovaya. And the cliff, Plakuchiy Kamen, which rises through it perpendicularly, looks like a fabled giant who has come to take a look at the people's work by the river. It is here, 18 kilometers from Chusovoy settlement, that the collective of the Specialized Administration for Underwater Engineering Operations No 6 (SUPTR-6) of Soyuzpodvodtruboprovodstroy [All-Union Association for Underwater Pipeline Construction] is getting ready to lay the 158-meter steel strand of gas pipeline in the riverbed.

We are standing on the right bank. The last preparations for the toss across the river are under way. Association representative V. Ivashchenko says:

"Just recently we were prepared to pull the inverted siphon through, when the river presented us with a surprise. The Chusovaya from time immemorial has been considered one of the most capricious of mountain rivers. It has also showed us its obstinate nature."

Section chief Ya. Gnativ gives a signal with a red flag to the chief of the operation. The steel cable shudders, tugged from the opposite side by a powerful winch. The latter will pull the inverted siphon across the river. The howling of the pipelayers is repeated by an echo, resounding from shore to shore. The pipe, 1,220 millimeters in diameter, belted with linings, as if dressed in a striped vest, is slowly raised from the ground and is "carried" guardedly to the water.

"Well, now it has begun!" says Vladimir Vyacheslovich.

Blaster V. Rogozhin enters the conversation:

"I have been working in the branch for 22 years, and this is the first time that I have been involved in a crossing so complicated. The river is lively, the bed of the channel is rock, and in the path of the inverted siphon is a vertical cliff of Permian limestone--there is nothing to hitch it on. What is to be done? It was decided, after pouring an auxiliary shelf along the vertical wall in the river, to combine the drilling of horizontal and vertical holes. Blasting formed a work site

site for people and equipment, and it helped in excavating the rocky ditch into which the inverted siphon will be laid on the left shore of the river, after it has been dragged."

Vasiliy Vasil'yevich falls silent and we watch the rope bring the inverted siphon slowly to the opposite shore. The work is going on in coordinated fashion. Commands are given in precise fashion and are being carried out with the same precision. A little later I was interested in how V. Ivashchenko had managed to use such innovations here on the Chusovaya, in addition to the original conduct of the drilling and blasting work.

"Each crossing is a singular proving ground for the testing not only of new technical ideas but also of the whole collective," he says. "Neither use of the new method of excavating the underwater ditch in the rocks by excavator nor the laying of the inverted siphon with welded taps would have worked with such success were it not for the selfless labor of such masters of their jobs as blaster V. Rogozhin, excavator operator M. Batyayev, bulldozer operator A. Safonov, driller M. Stukalenko, pipelayer operator Communist A. Zhuk, electric welder Yu. Babushko, X-ray machine operator E. Turovskiy and many others. This multiple-nationality section of SUPTR-6, in which Mordvinians and Belorussians, Ukrainians and Russians are working side by side, showed itself to be an experienced collective which maintains excellent labor traditions."

And now a red rocket is launched from the opposite shore, a signal of completion of the operations.

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PIPELINE CONSTRUCTION

## GAS-EXPORT PIPELINE BUILDING GOING WELL IN TATARIA

Moscow EKONOMICHESKAYA GAZETA in Russian No 47, Nov 82 p 20

[Article by V. Vedyakin, leader of a welders' brigade of Tatnefteprovodstroy [Tatar Trust for Oil Pipeline Construction] (Kazan): "Using the Neighbors' Experience"]

[Text] I have been working in Tatnefteprovodstroy for 12 years now. I have to lay lines in Tataria and Chuvashia and in Permskaya and Tyumenskaya Oblasts. And it should be recognized that the greatest degree of organization of the work and the highest pace of laying line have been achieved right here--in an integrated flow-line operations group.

The section of the Urengoy-Uzhgorod gas pipeline that the collective is to lay in Tataria and, partially, in the Mariyskaya ASSR will stretch for almost 220 kilometers. We shall have to overcome several large and small streams, cross railroad tracks and highways, and cut into forested tracts.

With ordinary work organization, where each specialized subunit operates on the route independently, that is, in essence, in isolation, more than a year would have been required. Understanding the significance of the assigned task, our trust's workers decided to make use of the advanced experience of Kuybyshevtruboprovodstroy [Kuybyshev Pipeline Construction Trust], which, for the first time in gas-pipeline construction practice, used the high-speed flow-line group method. Our specialists studied the Kuybyshev trust's experience in detail and familiarized themselves with the arrangement of affairs in the flow-line group under L. Mikhel'son, which is working on the line not far from Cheboksary. In September we formed a similar group on Tataria's section of the trunk gas pipeline. It now includes about 220 people, including management personnel and servicing-sphere workers at the field settlement, which is located on the outskirts of the rayon center Arsk.

Our settlement, with a foodstuffs store, a dining hall, central heating system and similar conveniences, was erected literally in mere days. Material incentives were telling in accelerating the work and making effective use of the KTU [Integrated Pipeline-Construction Administration].

With the work of the flow-line group done under one job order, the kilometer of gas pipeline that is finished and ready for testing is the main indicator. The wages of all the engineers and technicians of the flow-line group, the servicing personnel, and the drivers of the shift-workers' vehicles and tank trucks--everyone who works in the flow-line group, depend upon this indicator. In order to fulfill the

plan, those who work on the route receive bonuses. Additional bonuses are paid for each kilometer above the plan. On the whole, a worker can be given bonuses of up to 60 percent of the pay schedule. Engineers and technicians and white-collar workers--all those who are employed in the flow-line group--receive the bonuses. And each of us is motivated toward highly productive labor.

We have in the flow-line group eight basic brigades, which are specialized in welding, earthmoving, insulating, transport operations, and so on. Precise mutual actions among them are arranged. Each brigade knows what it must do during the shift in order to maintain a single rhythm in the work of the interdependent workers. We work without interruptions, rhythmically. Each 10 days we add up the results of our work. We pay attention to positive factors, try to strengthen what has been achieved, and attentively analyze oversights in order to avoid them in the future. We have good working conditions, and we have all the necessary resources on the route. We are provided fully with welding and earthmoving machinery and with automotive vehicles for various purposes. There are no interruptions in pipe deliveries.

Output per person in brigades has been increased by 20-25 percent. There are no cases of anyone who does not cope with the shiftwork task. The Workers' Relay, mutual assistance and mutual support help.

Having carefully weighed all its possibilities, our flow-line group's collective, which Hero of Socialist Labor I. Shaykhutdinov leads, has decided to complete all work on the section not by the end of 1983 but in April.

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## AMENITIES SUPPORT FOR GAS-EXPORT PIPELINE BUILDERS LAUDED

Moscow SOVETSKAYA TORGOVLYA in Russian 18 Nov 82 p 1

[Article by I. Myshalov (Zakarpatskaya Oblast): "The Line Leaves for the Mountains"]

[Text] So here I am again on the route of the export gas pipeline, which is under construction, towards Uzhgorod. Again I see those same Carpathian mountains, overgrown with thick forest, through which the gas pipeline "strand," which has no peer among similar structures, is already moving. The work here is complex and labor-intensive. Modern machinery has come to the aid of the people. Each day the pipeline goes ever farther into the mountains.

I happened to talk with advanced worker M. Plavyanik on the route.

"Our machinery, of course, gives us a good hand in the most complicated conditions," he said. "But also, the shopping service is not in last place in supporting the work successes....Write about our store and our dining hall. They operate excellently, honestly!"

I also heard kind words about local trade workers from excavator operator Zh. Baziyan, driver A. Kardumyan and other builders of gas facilities of the Transcaucasus Pipeline Construction Administration, which is working on the segment.

...It is 0600. In the dining-hall car in Ruskiye Komarovtsi settlement the first callers are dropping in. It is clean and cozy in the dining hall. On the menu is a wide choice of appetizers and salad items. There are sour cream, kefit, ragout made of mutton, fried sausage, pancakes, baked goods, patties, coffee and tea. The dining-hall car operates from early morning to late at night.

Ye. Diyak and M. Chub are not sparing in their efforts and skills as cooks. The dining-hall manager himself--cook fifth rank V. Kanevich--rolling up his sleeves, stands at the range: "The builders should be served without delay!"

"In a little while," says settlement mayor V. Gasanov, "we shall have a dining hall just like the one in Poroshkovo village."

It is, of course, much more convenient to work in a stationary dining hall, such as the one in Poroshkovo village. So a good-quality house is being built in Russkiye Komarovtsy for a dining hall. But even now the food which is being prepared, as they say, "on wheels," is of high quality.

The cookery specialists are paying special attention to supplying hot meals for those who work on the line in the mountains. Truck tractors deliver there, in special thermos containers, meals made up of three dishes, tea and mineral water. This whole procedure was worked out precisely, and not once has there been a delay with delivery. This fact, incidentally, was noted especially by specialists of the Main Administration of Gostorginspektsiya [Main Inspectorate of State Inspection for the Quality of Commodities and Trade] of the Ukraine's Ministry of Trade, who visited the route recently.

But man does not live, as they say, on bread alone. A retail network is also operating in the mountains. Trade has livened up, especially now, as families have begun to come to the gas-pipeline facility builders.

In Russkiye Komarovtsy village I managed to become acquainted with the senior saleslady of the car store, V. Drigola. In a small space she has managed to find a way to spread goods out and to show garments, footwear and knitted goods.

It must be added, moreover, that V. Drigola and her car store were on the Soyuz and Bratstvo gas pipelines. Along with many builders, she earned an honorary award--CEMA's anniversary medal for construction of the Soyuz gas trunk line.

"I and my colleagues understand well that we are in the same service as the gas pipeline builders," says Valentina Ivanovna. "Their business is our business. And the work on the route is very strenuous now. In order to be able to do crash work, one must be in a good mood. And this, of course, is our concern...."

The whole collective of the Mukachevo ors [workers' supply division] of Ukrgazstroy [Ukrainian Trust for the Construction of Gas Industry Facilities] is working with such a mood. It strikes the eye that they are toiling here with the long term in mind--all the construction will be expanded still more in scale. Therefore, mechanized potato, fruit and vegetable storages, where potatoes, onions, vegetables and fruits are piled up for the winter, have already been equipped. Thirty head of hogs have been sent to a recently built hog-feeding center, for fattening up.

"Right now we are servicing two towns," says ors chief S. Mokan'. "We are trying to improve the shopping network. The new model store in Russkiye Komarovtsy will celebrate a housewarming soon. A store for articles of daily use will be built in Poroshkovo village. In the near future work will begin on the welding stand in Obava village, Svalyavskiy Rayon--on the next segment of the gas pipeline. We also are getting ready to begin our activity there...."

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PIPELINE CONSTRUCTION

## GERMANS PREPARE TO BUILD GAS-PIPELINE COMPRESSOR STATION IN TAMBOVSKAYA OBLAST

Moscow IZVESTIYA in Russian 19 Nov 82 p 3

[Article by V. Romanyuk (Tambovskaya Oblast): "Collaboration"]

[Text] A compressor-station complex is rising up not far from Tsna stream, in eastern Tambovskaya Oblast. We were passing by the buzzing units with Yu. Sokolov, chief of the Gas-Compressor Service of the Morshansk Line Operations Administration for Trunk Gas Pipelines. The first compressor station has been working here now with two departments--gas-turbine and electric drive--during two five-year plans. It is servicing the Central Asia-Central Economic Region gas pipelines. Yuriy Yakovlevich arrived at Algasovo 10 years ago from Kazakhstan, where he had worked on the Bukhara-Urals gas pipeline.

In recent years this northeastern corner of Tambovskaya Oblast has become an intersection for a whole system of deep rivers of gas. In addition to the three Central Asia-Central Economic Region trunk lines, two strands of the Urengoy-Petrovsk-Yelets gas pipeline have been laid here. A compressor station made up of six units has been introduced here for servicing it, and another one like it is still under construction. These units are of the open type--their interlocking yellow and silver is visible far away in the steppe. The equipment for this high-capacity gas-pumping assembly was sent by Leningrad and Sumy machinebuilders and by Kuybyshev aircraft builders.

Today the Algasovo industrial site is extending its boundaries: pile driving at the construction site of KS-27 [Compressor Station No 27]--a compressor station of the Urengoy-Pomary-Uzhgorod gas pipeline--has started. The collective of Construction Administration No 22 of Tambovkhimpromstroy [Trust for the Construction of Chemical Industry Facilities in Tambovskaya Oblast] is doing the work. Six high-capacity units will be installed here on pile footings.

The client's representative--the Pervomaysk Department of the Moscow board for the gas pipelines that are being built--have much business here today. Chief department engineer G. Vasil'yev said that up to six carloads of freight that are addressed to the compressor builders will arrive at the Morshansk Railroad Yard daily. Components for connecting up the compressor station integrally with measuring instruments and shut-off and shaped fixtures have been received in the full amount. Scraper launching and receiving traps have been shipped from Japan. A 17-ton module--a stabilizing device for the receiving components--has just arrived from there. Fixtures are coming from France, Italy and Spain. Domestic enterprises are shipping the equipment on schedule.

Electric-drive units will be installed at KS-27. In accordance with the technology, the gas is to be cooled by 15-20 degrees, to enable gas pipeline throughput to be increased.

While Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] line workers are erecting the linear portion, the compressor station is to be erected by local Tambov builders, who are successfully assimilating high-speed methods for doing the line-workers' work. An oblast staff has been created to monitor progress on the erection of this most important facility.

It must be said that Tambovkhimpromstroy builders have no little experience in building compressor stations. The collective of Construction and Installing Administration No 22, under N. Yemel'yanov, is erecting open-type units with high quality at the Algasovo industrial site. The Tambov construction workers have introduced ahead of schedule units that were shipped by the Neva Plant V. I. Lenin and the Sumy Machinebuilding Association.

The block of Algasovo compressor stations today has a reserve of capacity that will insure uninterrupted delivery of the blue fuel throughout the whole gas trunk line, including, if required, also the Urengoy-Pomary-Uzhgorod transcontinental gas pipeline. And, with the introduction of KS-27, the reserve will increase so much that they can also service still another strand, one which will have its start at the new Yamburg field, which is being developed east of Urengoy.

But 130 kilometers from Algasovo, in Pervomayskiy Rayon--this is now at the western border of Tambovskaya Oblast--work is being promoted on a second phase of the compressor station. The collective of the Construction and Installing Complex of the VMK, from the city of Halle (German Democratic Republic), will erect it. This collective also has experience in gas-transport construction. When the Soyuz gas pipeline was laid, the complex's specialists built five compressor stations on the Kremenchug-Bar segment.

When we flew in an Mi-2 helicopter to the GDR builders' settlement, we did not find the construction section chief, Raymond Konrad. He was at the Pervomaysk Rayon Party Committee, at a regular meeting dedicated to construction of the complex. Information center worker Nina Koch, who is Russian by nationality, showed us the field settlement. First the German friends were presented with a dormitory of the Pervomayskkhimash Plant and a dining hall and were allocated the necessary construction materials. Now, materials from the GDR are arriving regularly from the Bogoyavlenskaya Railroad Yard. Several tens of well-appointed prefabricated cottages have been assembled and finished in yellow plastic, and a large dining hall is being built. Sites for erecting buildings for a department store, a polyclinic, a pharmacy and a library have been set out. Earthmoving and construction machinery and transport equipment are accumulating at the site. Machinery that can be operated under severe winter conditions, at low temperatures, is being sent to the USSR.

And now at the headquarters of the project we converse with supervisor of the Pervomaysk construction section, Raymond Konrad, and partog [party organizer] Klaus Pretsel.

"We understand the international significance of the construction project," says R. Konrad, "and we shall try to do the work on time and with high quality. This year

we face the task of building a well-arranged settlement and laying an access road to the compressor station site. Besides the prefabricated cottages, panel-type housing is to be built; after completion of the construction period, this housing will be turned over to Soviet compressor-station personnel."

Party organizer K. Pretsel, who was included in the conversation, reported that a third of the builders of the section are communists, there are also many Komsomol members here, and the collective's average age is about 30 years. On Wednesdays, meetings are held with the party supervisors of the Pervomayskiy Rayon Party Committee, and there is a joint plan for party and political work.

During our conversation, the chief engineer--the land manager of the Novderevenskiy Rayon Ispolkom M. Petrishchev--came into the office. This rayon, on the border of Tambovskaya Oblast, is located in Ryazanskaya Oblast. There is no quarry for getting the required amount of sand and gravel close to the compressor station, so an appeal to the neighbors for help was made. A mutually satisfactory agreement was reached: the German builders will send 100,000 cubic meters of sand per year to the construction project and, by way of mutual assistance, will lay a hard-topped road in the rayon center--Aleksandro-Nevskiy settlement.

"The task we face is important and urgent," said R. Konrad at parting. "With the start of 1983 we shall promote work full steam on the basic compressor station site. We shall be ahead of schedule at all stages--from design to installation of the units."

Our Mi-2 circles above the field settlement of the German construction workers. The representatives of the German Democratic Republic are making themselves at home firmly and thoroughly. And both here at Algasovo and near Pervomayskiy, Soviet and German construction workers are working on a common job--they are erecting compressor stations for the Urengoy-Pomary-Uzhgorod gas pipeline, indicating, in so doing, to the whole world that friendship, internationalism and the skills of the working class are not mere slogans but a living active force.

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PIPELINE CONSTRUCTION

GERMANS TO WORK ON PIPELINE CONSTRUCTION IN UKRAINE

Moscow PRAVDA in Russian 17 Nov 82 p 4

[Article by S. Baygarov (Ivano-Frankovsk): "Kilometer after Kilometer"]

[Text] This gas pipeline will be 4,451 kilometers long. It is being erected in a single corridor with five other lines, it will pass through the lands of 24 oblasts and autonomous republics of the RSFSR and the Ukraine, and it will intersect permafrost and swampy areas, mountain ranges and 26 major rivers. It has no counterpart in world practice with regard to total capital investment or engineering characteristics.

And construction workers who have come from the GDR are taking part in erecting the trunk line.

There will be about 5,000 of them. They will lay 540 kilometers of pipe and build 7 compressor stations, housing, kindergartens and many other things. The Union of Free German Youth (SSNM) has announced this facility as a central youth construction project. The first groups of specialists from the fraternal country have arrived for work.

I came to Ivano-Frankovsk at a time when the autumn pigments were richly covering the luxurious tops of the trees, and the avenues were strewn with polished chestnuts, like sea pebbles. I had been here a few years before. Hungarian builders were then erecting several compressor stations on the last Carpathian section of the Soyuz gas pipeline. In town I often now see young people with the SSNM emblem on their sleeves.

The headquarters of the GDR builders is temporarily located, until a new building is constructed, in a small house on a quiet street. It was here I met with the leader of the party staff at Ivano-Frankovsk, Wolfgang Suche. Suche had also been on the Soyuz, so, in talking about today he often recalled a gas trunk line that had already been built.

"When the news was spread that 'our' segment of the gas pipeline had been declared a central youth construction project," he said, "more than 17,000 boys and girls signed up as volunteers. So we had to make a strict selection. In the first place, one had to be recommended by SSNM committees, and, finally, everyone should have a trade. Special preference was given to those who had acquired experience on the Soyuz. All the supervisors--from brigade leaders on up--had worked on that trunk pipeline...."

On the Carpathian section the GDR builders are welding, insulating and burying about 140 kilometers of large-diameter pipe, they are surmounting two rivers, including the Dnestr, and they will go through a swamp. They will have to build compressor stations, and also housing, kindergartens and nurseries, polyclinics and other social and domestic-affairs facilities in the cities of Bar, Bogorodchany and Volovets. The builders are hurrying, for the compressor station of the first phase in Bar should be started up in a few months.

...The black asphalt of the road cuts through the soft green of winter crops. The Romanian-made Yurkiy all-terrain vehicle with the Leipzig license plate delivered us quickly to Berezovka village. A comfortable village for the GDR builders rose up on its outskirts in a few days. The welding base is here. Around it are floodlights. The work does not stop, even at night. High-powered cranes grasp multiton pipes. They are laid in a special bed and are centered by means of a pipe handler and other mechanisms, and then they are welded manually, and after that an automatic welding machine goes into operation. Reliability comes first.

The secretary of the SED [Socialist Unity Party of Germany] organization for the line segment, Eric Zimmert, introduces me to the shift. Frank Keping is chief of this base, Hans Reibling is the brigade leader, and Reinhard Kress is a worker. The most experienced of them, by common recognition, is the brigade leader.

"I have a special relationship with it," Reibling nods in the direction of the pipe, the diameter of each of which is almost the size of a man. "For I worked on the Soyuz, as they say, from the first stake to the last joint on our segment. And it is not only I who have been here so much. And now you are here again. With my trade you do not stay in one place very long....My wife is already growling," suddenly with a smile he added, "come home, she says, when you have a leave."

Hans Reibling is not ready to stay long at the welding base. With his experience, he considers it better to work on the route, where it is more difficult.

I am interested in whether he has counted the kilometers of pipe he has welded. The brigade leader tilts his helmet back, thinks for a minute, and answers after a brief pause:

"If it is approximate, then it will be 240 kilometers."

The short smoke break ends, and the workers disperse to their places. One of them waves his hand to the pipeline layer operator and suddenly shouts in Russian:

"Great, let's go!"

Operator Vyacheslav Senyuk is working in the Transcaucasus Pipeline Construction Administration, which is extending the "strand" right in the Carpathians; the pipelayer is also from there. The neighbors have concluded an agreement about collaboration and exchange of experience. The German comrades told me they had experienced especially great support at the start, when they still did not have enough machinery or people. Now, GDR vehicles that are free are operating, for example, on segments of that same Transcaucasus administration.

Local party, soviet and Komsomol organizations have taken upon themselves a portion of the concern connected not only with construction but also with the daily life and leisure time of the GDR specialists. The Ivano-Frankovskaya Oblast Party

Committee has planned a series of measures, among which are recreation evenings, sports meets and production of a radio magazine, "Internatsionalist," in the Russian and German languages, the organization of concerts and courses in the Russian language, meetings with writers, and many other things.

"The gas pipeline that is being built is of great economic importance for both the Soviet Union and our republic," said Wolfgang Suche. "The experience gained during construction of the Soyuz gas pipeline suggests that if we get down to business harmoniously, success will come unfailingly."

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PIPELINE CONSTRUCTION

## GAS PIPELINE CROSSING OF DNEPR DESCRIBED

Kiev PRAVDA UKRAINY in Russian 27 Nov 82 p 1

[Article by Ya. Volovichenko (Cherkasskaya Oblast): "A Throw Across the Dnepr"]

> [Text] And now the time has come to lay the first gas pipeline "strand" on the bottom of a great Ukrainian river in the Prokhorovka district, near Cherkassy. Not so long ago, in the report, "A Throw Across the Dnepr" (PRAVDA UKRAINY, 14 September), the start of work to overcome the major water barrier was reported. At that time dense sharpleaf willow and sand bars surrounded the river on both sides in this area. In a short time--2.5 months--the picture has been changed beyond recognition.

We begin our reporting about the events that have been going on here from an Mi-2 helicopter, which was hanging low above the Dnepr's floodlands. A grand panorama of a majestic construction project was revealed from a low altitude. The long, precisely excavated ditch on the left bank reminded one of the bay of a department of a large industrial enterprise. Enormous pipelayers, which raised high their powerful "shoulders" and can hold onto and move tens of tons of freight from place to place, were located along the ditch in two rows. Between them sprawled the inverted siphon, more than 900 meters long, like some kind of a mysterious monster. It consisted of four lengths that had not been welded together yet, coated with insulating material, with wooden lining and heavy cast-iron weights.

On the right bank could be seen a high-powered winch which will tow the inverted siphon under the water. Two small boats are traveling on the Dnepr's smooth surface. They will help to pull and adjust correctly the cable that is fastened to the winch.

The helicopter circled above the local event. The helicopter commander, Anatoliy Ignat'yevich Bovkonyuk landed the craft skillfully near the head portion of the inverted siphon. At this time the pipelayers began to align all four pipelengths on the center. A. P. Viter, chief of the Kiev section of the Specialized Repair and Setting-Up Administration of USSR Mingazprom [Ministry of Gas Industry] came ashore from a boat. He reported to the specialists of the general contractor--the Cherkassy production administration, Eksporttransgaz--the fact that he had once more checked the status of the deep part of the river and gave the authorization to pull the inverted siphon.

Several pipeline layers tightly grasped the first 250 meters of the metal pipelength. On its leading part they had fitted a cap--a snug attachment, on the hook of which the cable was caught. A buoy with a red flag, which would be seen above the water surface, to show the advance of the inverted siphon, had been fastened here. The words, "Crack the Dnepr!" were revealed in large letters on the cap.

A bright rocket soared into the sky--a signal that the inverted siphon was beginning to move. Under the onslaught of the pipelayers, the first length of pipe, after flinching, slowly began to crawl into the water. Involuntarily, all those present applauded--the event was truly impressive.

The major portion of the pipeline was now covered by the depths. The buoy and its flag proceeded with precision along the prescribed path, and this was reassuring to all present and to the construction-organization specialists, for the inverted siphon was moving correctly.

"Stop!" came the command.

At that very second, the pipelength stiffened in place. More properly, not the whole length, but about a third of it. The next 230-meter strand was pulled to and centered on it, and then was welded onto the first part. Thus, step by step, strictly without haste, the installers and welders laid the siphon on the Dnepr's bosom.

The collectives of many construction organizations are taking part in this work: Soyuztruboprovodstroy [All-Union Pipeline Construction Administration], SUPTR No 5 of Vostokpodvodtrubovodstroy [Trust for Underwater Pipeline Construction in the Eastern Economic Region], and others. Experienced masters of their business--installers, welders, pipelayer operators, bulldozer operators and divers--work here. Many of them are former front-line soldiers, veterans of the Great Patriotic War.

"When the Ukraine was being liberated, I, as a diver for the 1st Separate Detachment of Underwater Operations of the 4th Ukrainian Front, laid a cable along the bottom of the Dnepr at Lepetikha--says Gleb Aleksandrovich Sanayev. "For this I was awarded the Order of the Patriotic War, First Degree. My role is that of chief specialist of the Divers Inspectorate of Vostokpodvodtruboprovodstroy, and, for the second time I am participating in an assault, but a peaceful one, on our native Dnepr."

And Sanayev and hundreds of other construction workers are doing all the things that are necessary for successful fulfillment of the most important task of creating the Urengoy-Uzhgorod gas-export pipeline. They are dedicating their labor achievements to the 60th anniversary of the creation of the USSR.

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PIPELINE CONSTRUCTION

## GAS PIPELINE CROSSING OF VOLGA DESCRIBED

Moscow TRUD in Russian 14 Oct 82 p 1

[Article by Ye. Ukhov (Zvenigovo, Mariyskaya ASSR): "The Trunk Line Steps Across the Volga"]

> [Text] Seven months ahead of schedule, the laying of an inverted siphon of the Urengoy-Pomary-Uzhgorod gas pipeline route across the Volga's channel has been started at the Mariy town of Zvenigovo.

Now the hour has come for which the installers, welders, equipment operators, dredge crews and divers have prepared so strenuously and thoroughly. The order "Start!" rings out over the Volga's gray ripples. The 300-ton hoist starts to seethe, while the cable, as thick as an arm, is stretched tight, like a bass string, and all at once the pipelayers' engines let out a roar. The monstrous snout of the inverted siphon begins to move, as if unwillingly, imperceptibly to the eye. Gradually the "head" plunges into the water, and now the whole pipeline length has begun to crawl into the river, dragging hundreds of tons of steel and cast-iron sinkers....

The nomadic microcamp of the Kazan Specialized Administration for Underwater Engineering Operations, with its only street, Urengoyskaya, was built at kilometer 2,242, in the middle of the transcontinental trunk line. Arriving here a week early, I found the administration chief V. O. Pelipenko and section superintendent M. Arapov preoccupied. Until now excavation of the ditch bottom had gone on schedule, but ahead of the exit itself, on the right bank, a cutter of a suction dredge had cut into a thick clay deposit. Forcing it by ordinary means only stirred up the water. A more powerful machine had to be redeployed in a hurry from the Kama in order to excavate the clay monolith. The move was completely justified. But in order not to be knocked off the "startup" schedule, it was necessary to make up for lost time and to concentrate on the deadlines, already tight, for the remaining underwater work.

Chief of the underwater workers, Farkhat Shaydullin, came into the superintendent's office, rustling a wet waterproof cape and wearing a thick diving sweater. Throwing the hood back, he sat down at the table and entered into the calculations without stopping. Farkhat is an experienced diver with almost 3,500 hours (3 months in a diving suit!) underwater, and his opinion was authoritative for the administration chief. In choosing a bed for the gas pipeline, the chief had measured off the

bottom with his lead boot, and he investigated the slopes and edges of the ditch far and wide by touch, so he knew all its peaks, bends and depressions.

On the path to the shore, where the motorboat waited, in order to whirl them away to the dredge, which could be seen indistinctly through a shroud of rain, Vladimir Georgiyevich told me that this was the 40th crossing in a row for the administration's collective. Before this the inverted siphons had been even longer: the celebrated Druzhba oil pipeline at Syzran stretched across a reservoir with a 5-kilometer surface. This siphon was half as long, but then the pipe's cross-section was unique, and the weight--6,000 tons--was a record. It was the first time that they had had to conceal such a bulky and cumbersome object under the water.

"We are 7 months ahead of schedule. The underwater construction workers, under Kh. Khasanov, V. Semenovy and V. Iskanderov, have taken 630,000 cubic meters of soil from the bottom, and they have brought the bed of the gas pipeline to the designed grade level. In places the ditch is up to 16 meters deep. We have to be careful to avoid submerged logs and other underwater 'surprises'."

The scene on the left assembly shore is like an ordinary construction site: the ground has been hacked into a cabbage by the tracks of the heavy tractors, with piles of sand and gravel rising up. Moreover, the structure of the inverted siphon reminds one of an assembly for housing made with prefabricated sections. Only these sections were 200 meters long and weighed 400 tons each. All 12 were manufactured 70 kilometers from here, at a mechanized bed in Kazan.

The underwater bridge across the "main street of Russia" will be two-lane. Siberian gas from Zvenigov will dive into two steel columns and, on crossing the water obstacle, will fuse together into a common channel. A wide cut has been hacked in the forested cliffs on the right bank. Here the integrated flow-line operations brigade of L. Mikhel'son from the Kuybyshev Pipeline Construction Trust, which right now is at work in Chuvashia, will connect his section of the pipeline to the siphon.

...The siphon is lowered meter by meter into the ditch. The submergence goes according to plan, and after it comes the all-seeing profile-recording instrument, which is installed on a small boat. The collective is committed to completing the most complicated hydraulic-engineering operation in the shortest time possible. And still another detail. Burial of the largest water obstacle on the route of the Siberian gas does not impede Volga boat captains. Ships are not denied the river for even an hour.

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PIPELINE CONSTRUCTION

## ARRIVAL OF DEEP FREEZING ENHANCES GAS-EXPORT PIPELINE CONSTRUCTION

Moscow SOVETSKAYA ROSSIYA in Russian 12 Dec 82 p 1

[Article by R. Yevseyeva: "A Third of the Road Has Been Traveled"]

> [Text] Builders of the Urengoy-Uzhgorod gas pipeline have achieved a high labor success. Yesterday the laying of the 1,500th kilometer of arterial on the route was completed. The Main Control Administration of the Ministry of Construction of Petroleum and Gas Industry Enterprises reported this. A third of the linear portion of the pipeline is ready to receive Siberian gas. This goal was reached well ahead of the plan deadlines.

The builders of the Urengoy-Pomary-Uzhgorod gas pipeline will remember the surprises of the drawn-out autumn for a long time. Over the entire length of the route--in both Arctic Urengoy and the Urals regions, and even in the European part of the country, the air temperature has been the same, and most unsuitable for operations: from 5 to 7 degrees above zero. December began with freezes. But what kind? In Urengoy, for example, the thermometer dropped from 2 degrees above zero to 45 degrees below in 2 days.

For all that, the first days of winter gave the gas-line builders several days of favorable weather. Everywhere possible, work was begun to organize passageways to the line and to construct roads. And then--the accelerated importation of pipe-lengths. More than 2,000 kilometers of pipe have already been delivered to the site. Thanks to this, welding and insulation of the pipeline could be undertaken on time. Up to today, about 1,750 kilometers of the trunk line have been welded into the strand.

As before, the pace of the best collectives on the route has been stable. In the last week of November, A. Skokov's flow-line group from Omsktruboprovodstroy [Omsk Pipeline Construction Trust] laid 6.3 kilometers of pipe in the ditch--300 meters more than had been planned. Work is also being conducted successfully in the flow-line groups of V. Radchenko from Ukrtruboprovodstroy [Ukrainian Pipeline Construction Trust], S. Matsko from Vostoknefteprovodstroy [Oil Pipeline Construction Trust of the Eastern Economic Region] and V. Nagornyy from Omsktruboprovodstroy.

Subunits of Specialized Administration for Underwater Engineering Operations No 5 of Soyuzpodvodtruboprovodstroy [All-Union Association for Underwater Pipeline Construction] completed its assault crossing of the Dnepr--the second largest of the

water obstacles in the European part of the USSR. Precise work organization and high-powered modern equipment enabled them to pull the kilometer-long inverted siphon over the river bottom almost half a year ahead of schedule. But the underwater strand itself was laid in 3 days.

Work on the line itself is being completed at many sections these days, but preparations for blow-through and test of the finished elements of the trunk line are starting. The collective of Integrated Flow-Line Operations Group No 1 of Kuybyshevtruboprovodstroy [Kuybyshev Pipeline Construction Trust] completed all the operations on its 60-kilometer section--from the Volga's right bank to the Zavolzhskaya Compressor Station. The specialists are ready to undertake testing, but it has been noted that certain parts of the equipment are still lacking: shaped items, T-joints....It is difficult to criticize Mingazprom [Ministry of Gas Industry] for this, for the pace of gas pipeline construction is upsetting all the delivery schedules. In order to keep this from happening, the suppliers must restructure their work and provide the pipeline workers with the required equipment with greater responsiveness.

The Board of the Ministry of Construction of Petroleum and Gas Industry Enterprises at one of its meetings examined the question of fulfilling increased socialist commitments adopted by the industry's collectives in honor of the 60th anniversary of the forming of the USSR. It was recognized that most of the flow-line operating groups that are working on the Urengoy-Pomary-Uzhgorod line have been coping successfully with their commitments. Since the start of the year the pace of erecting the gas trunk line has risen 10-fold. The builders have reexamined their tasks for January and February of next year and have made them more strenuous. The collectives that work on the line are filled with resolve to weld, insulate and lay in the ditch by the end of the year more than 2,000 kilometers of the trunk pipeline. This is almost half of its entire length.

> The Chelyabinsk Piperolling Plant, one of the suppliers of large-diameter pipe for the gas pipelines that are under construction, has produced about 8,500 tons of pipe above the plan for the first 10 months of the year. The enterprise's workers are consistently increasing the output of a high-quality product, reducing its prime production cost through savings of metal, fuel and electricity.

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